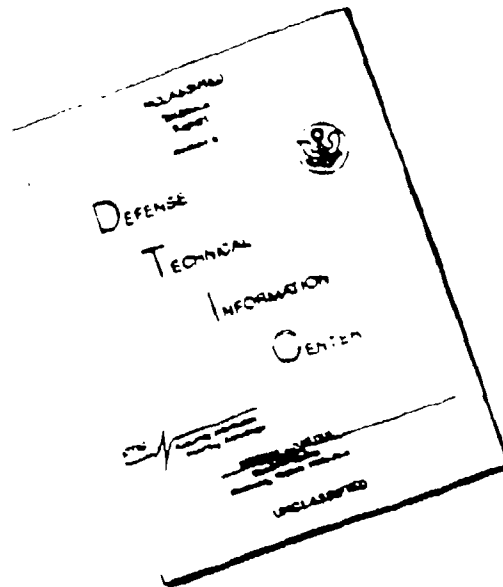


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FOREWORD

"Compilation of Fallout Patterns and Related Test Data (U)" is the second volume of a series to be published by the US Army Nuclear Defense Laboratory and the US Naval Radiological Defense Laboratory under the inclusive title, "Local Fallout From Nuclear Test Detonations (U)." This work is sponsored by the Defense Atomic Support Agency under DASA Project 10.013, "Fallout Data Compilation, Collation, Evaluation, and Presentation."

This volume is a supplement to Volume II; it includes nuclear tests conducted by the United Kingdom through 1958, the Republic of France through 1962, and the Union of Soviet Socialist Republics through 1962.

NOTICE

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DIGEST

The available fallout patterns and related test data for nuclear weapon tests conducted by the United Kingdom, the Republic of France, and the Union of Soviet Socialist Republics, are included in this supplement to NDL-TR-34. The related test data for the British and French tests include: date and time of detonation, location of test site, total yield, fission yield, type of burst and placement, height of burst, cloud-top and -bottom heights, crater data, and wind information up to nuclear cloud-top height.

No fallout patterns are available for any of the Soviet detonations. The list of Soviet detonations, which is as comprehensive as possible, contains the chronological order of the detonations, date, yield, type of burst and location of test site.

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SUPPLEMENT TO VOLUME II
FOREIGN NUCLEAR TESTS (U)

I. INTRODUCTION

A. Objective.

The objective of NDL-TR-34, Parts I and II, was to provide a convenient reference of United States nuclear detonations, fallout patterns, and related test data for scientific and technical personnel engaged in the measurement, analyses, and use of nuclear weapon-effects data. This supplement extends the scope of NDL-TR-34 to include weapon tests conducted by other nations, namely the United Kingdom, the Republic of France, and the Union of Soviet Socialist Republics (USSR).

B. Scope and Organization of Supplement.

This supplement presents a compilation of data from published and unpublished reports, but does not attempt to completely evaluate all the information on which the results are based. Although local (early) fallout is emphasized, the data presented will also be useful to those studying world-wide fallout. For the purposes of this report, local fallout is defined as all fallout consisting principally of the larger particles that are deposited within 24 hours after the detonation. World-wide or delayed fallout is defined as fallout consisting of very small particles that descend very slowly over large areas of the earth.

The information presented includes residual radiation patterns, wind and cloud measurements, and conditions of detonation, when known. Data resulting from each British, French, and USSR detonation are presented chronologically. For each British detonation, the basic information useful for an interpretation of fallout data is presented first. This is followed by on-site and off-site fallout patterns, where available. Wind speed and direction are then tabulated as a function of altitude, and hodographs are presented as an aid to visualizing these data.

The presentation of French detonations is analogous to that of the British, with the exception of wind and cloud data. No wind or cloud data are available for the French tests.

The section of USSR detonations presents a partial list of the shots with the date, yield, type of burst, and location of test site listed. These are the only available data relative to USSR nuclear detonations.

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C. Background.

The United Kingdom tested twenty-one devices in the 6-year period, October 1952 to September 1958.

The detonations included a surface burst on soil, a surface burst in a ship on water, eight detonations on 100-foot towers, three air bursts from balloons at 1,000 feet to 1,500 feet, and eight air drops that burst at altitudes ranging from 500 to 9,500 feet.

Since February 1960 the Republic of France has detonated nuclear devices.

The USSR tested from August 1949 to November 1958, when the moratorium became effective. When the moratorium was violated in 1961, an additional were detonated through November 1961.

D. Abbreviations Used in Supplement.

DASA - Defense Atomic Support Agency
GMT - Greenwich Mean Time
GZ - Ground Zero
keV - kilo-electron Volt
km - kilometers
kt - kiloton
MeV - Million electron Volt
MPG - Maralinga Proving Ground
mph - miles per hour
MSL - Mean Sea Level
Mt - megaton
nm - nautical miles
t - time

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III. PRESENTATION OF DATA

A. United Kingdom Detonations

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OPERATION HURRICANE

GMT
DATE: 2 Oct 1952
TIME: 2359

SITE: Monte Bello Islands
off northwest coast of
Australia 20°S 115°E

TOTAL YIELD:
FISSION YIELD:

TYPE OF BURST AND PLACEMENT:

Shallow underwater - Device in
hold of ship moored in 40 ft of
water about 400 yds off Trimouille
Island.

CIC'D DATA:

REMARKS:

The dose-rate levels over the Monte Bello Islands were determined by
re-entry parties using portable radiac dose-rate meters. Actual decay
measurements were used to extrapolate to H+1 hour. The decay exponent
was -1.2 between 12 and 100 hours, -1.0 between 100 and 200 hours, and
-1.6 after 200 hours.

TABLE 1 WIND DATA FOR OPERATION HURRICANE

Altitude (MSL) feet	Direction degrees	Speed mph
Surface	---	---
1,000	158.5	17.2
2,000	141.5	16.7
3,000	133.0	17.1
4,000	129.0	14.0
5,000	123.0	12.9
6,000	117.5	12.2
7,000	117.5	11.6
8,000	122.0	10.6
9,000	129.5	9.7
10,000	138.0	9.1

Altitude (MSL) feet	Direction degrees	Speed mph
11,000	147.0	8.6
12,000	154.0	8.4
13,000	163.0	8.0
14,000	176.0	8.0
15,000	194.0	8.3
16,000	212.5	9.4
17,000	228.0	11.5
18,000	239.0	13.6
19,000	246.5	16.0
20,000	251.0	18.4

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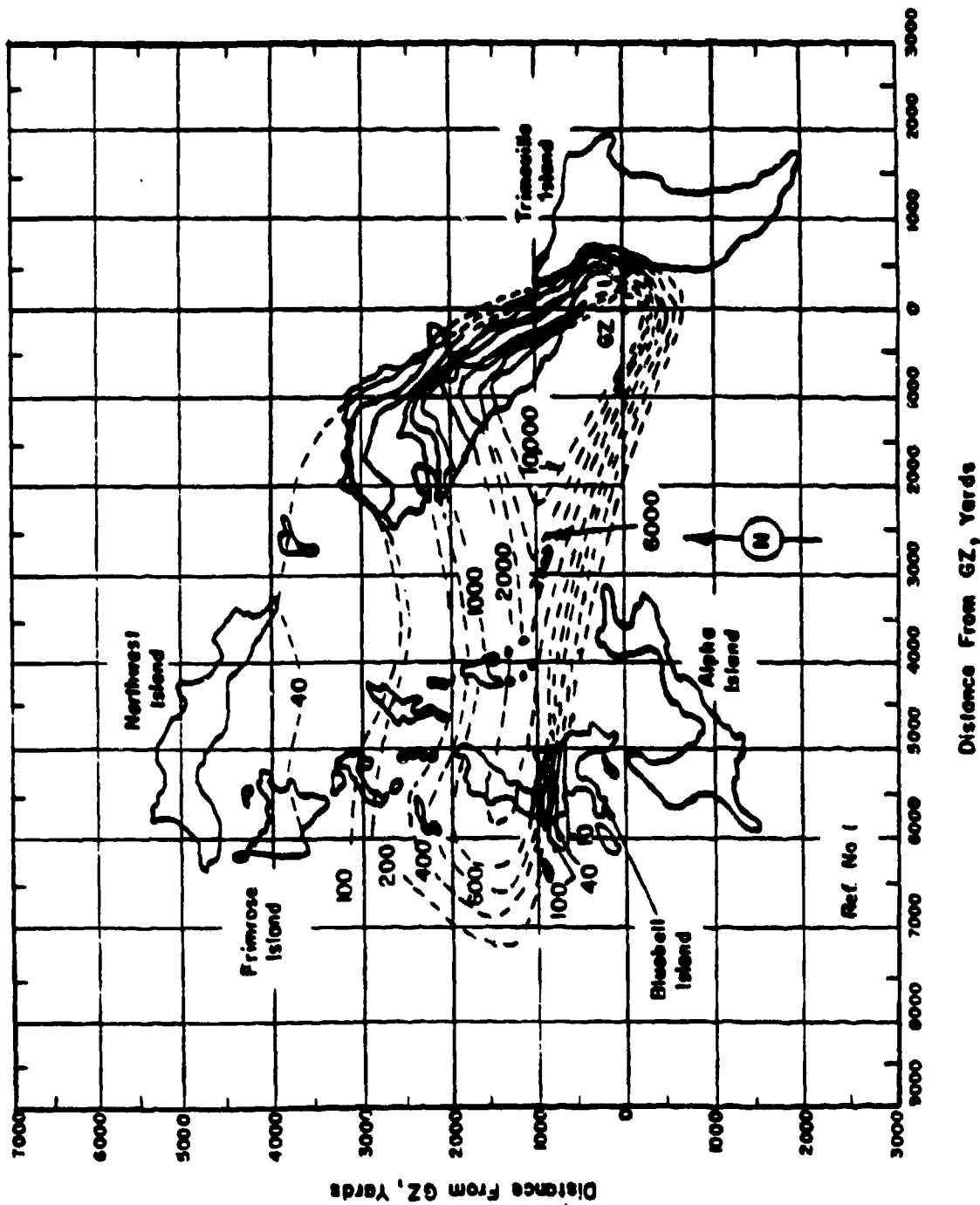


Figure 1. Operation HURRICANE, Monte Bello Islands
Off-site dose-rate contours in r/hr at 1000 hours.

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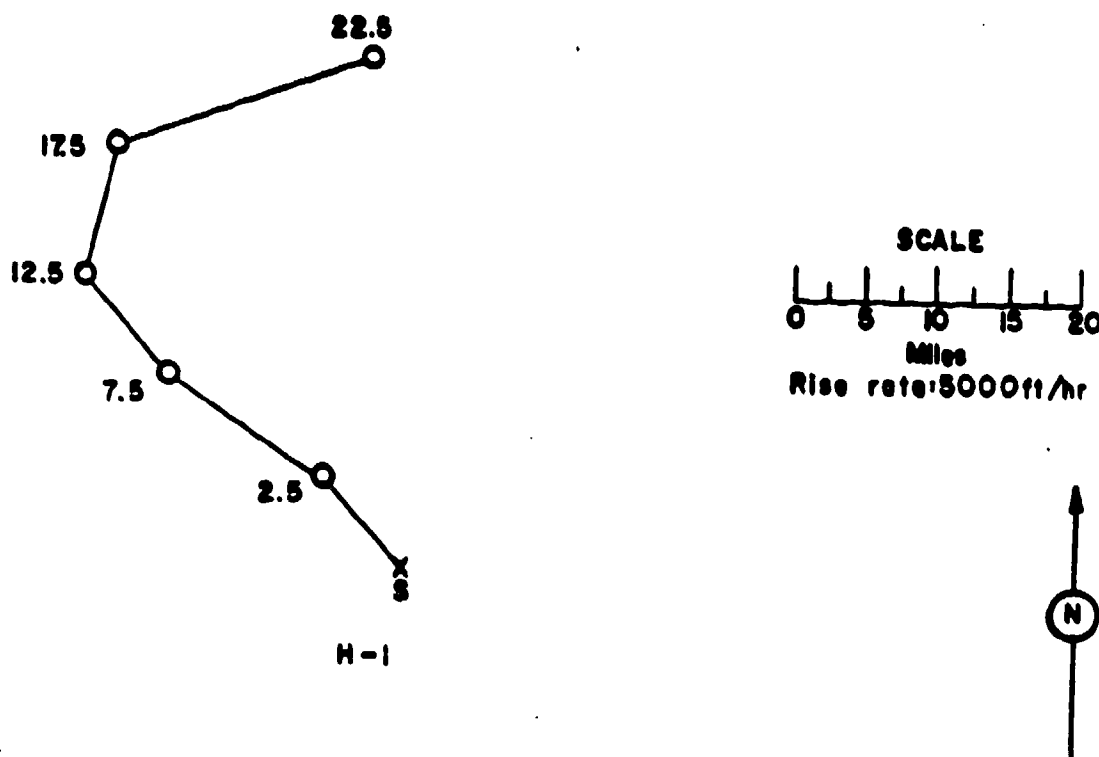


Figure 2. Hodograph for Operation HURRICANE

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OPERATION TOTEM - Round 1

DATE: 14 Oct 1953
TIME: 2130

SITE: Test held at EMU Flats,
South Australia, 300 miles
NW of Woomera
31°S 137°E

TOTAL YIELD: [REDACTED]
FISSION YIELD: [REDACTED]

HEIGHT OF BURST: 100 ft

CLOUD TOP HEIGHT: [REDACTED]
CLOUD BOTTOM HEIGHT: [REDACTED]

TYPE OF BURST AND PLACEMENT:
Tower burst over Australian soil

REMARKS:

The ground contamination contours were obtained by both ground and aerial surveys. The dashed line shows the estimated center line of the contamination pattern. The $t^{-1.2}$ decay approximation was used to extrapolate the readings to H+1 hour.

TABLE 2 WIND DATA FOR OPERATION TOTEM - ROUND 1

Altitude (MSL) feet	Direction degrees	Speed mph
Surface	---	---
1,000	250	3
2,000	225	8
3,000	220	14
6,000	225	21
9,000	225	24
11,000	225	37
13,000	230	39

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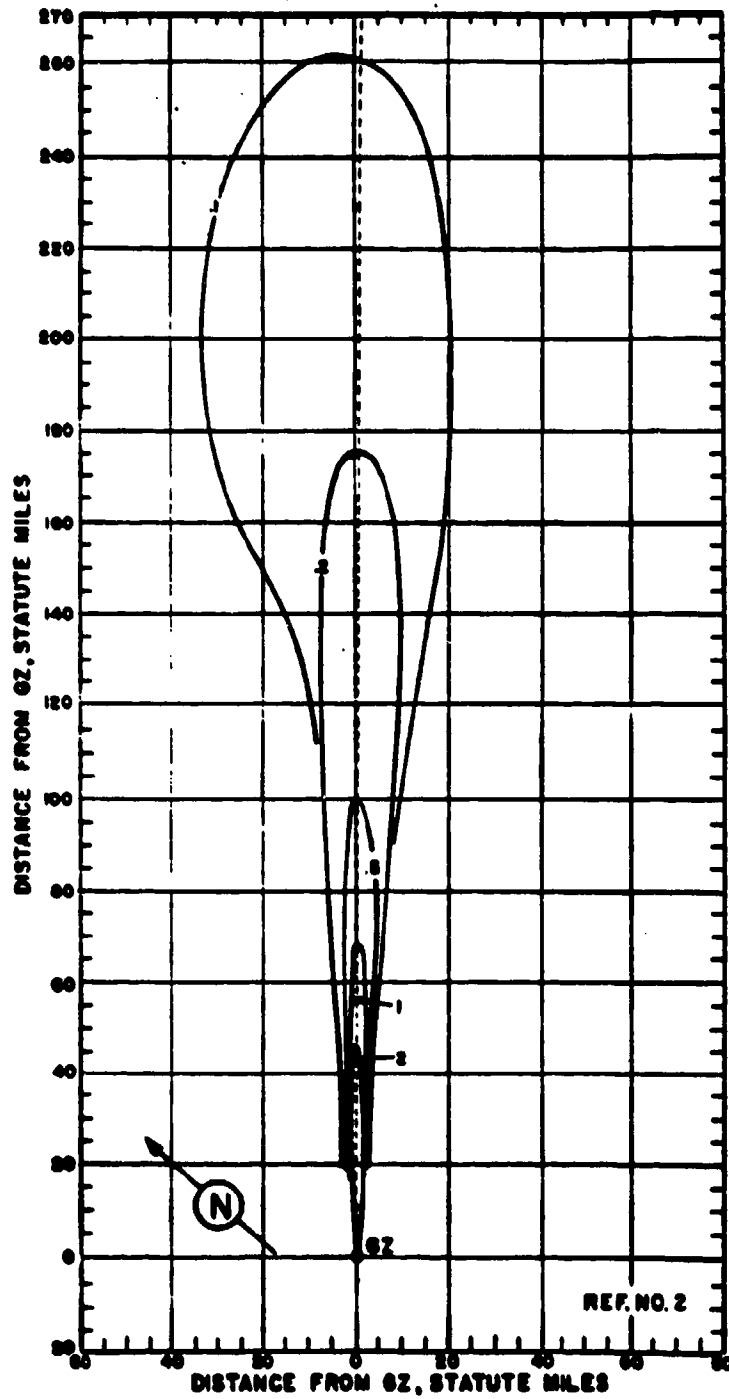


Figure 3. Operation TOTEM - Round 1
Off-site dose-rate contours in r/hr at H+1 hour.

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OPERATION TOTEM - Round 2

GMT

DATE: 25 Oct 1953
TIME: 2130

SITE: Test held at EMU Flats,
South Australia, 300
miles NW of Woomera
31°S 137°E

TOTAL YIELD:
FISSION YIELD:

CLOUD TOP HEIGHT:
CLOUD BOTTOM HEIGHT:

HEIGHT OF BURST: 100 ft

TYPE OF BURST AND PLACEMENT:
Tower burst over Australian soil

REMARKS:

The ground contamination contours were obtained by both ground and aerial surveys. The dashed line shows the estimated center line of the contamination pattern. The $t^{-1.2}$ decay approximation was used to extrapolate the readings to H+1 hour.

TABLE 3 WIND DATA FOR OPERATION TOTEM - ROUND 2

Altitude (MSL) feet	Direction degrees	Speed mph
Surface	---	---
1,000	30	29
2,000	25	36
3,000	20	37
5,000	05	33
6,000	350	28
10,000	340	26
15,000	325	23
20,000	315	22
25,000	300	26
30,000	295	32

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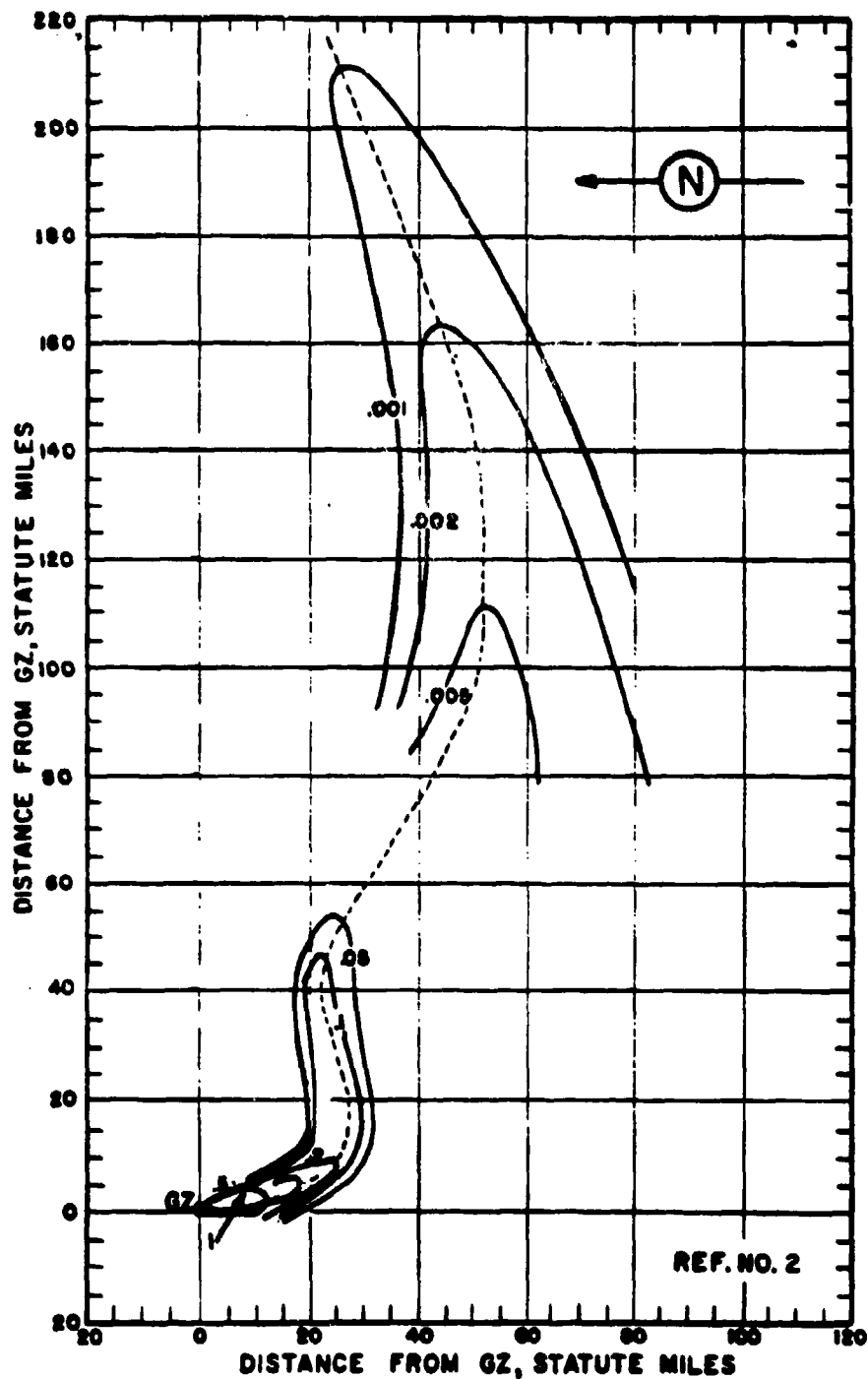


Figure 4. Operation TOTEM - Round 2
Off-site dose-rate contours in r/hr at H+1 hour.

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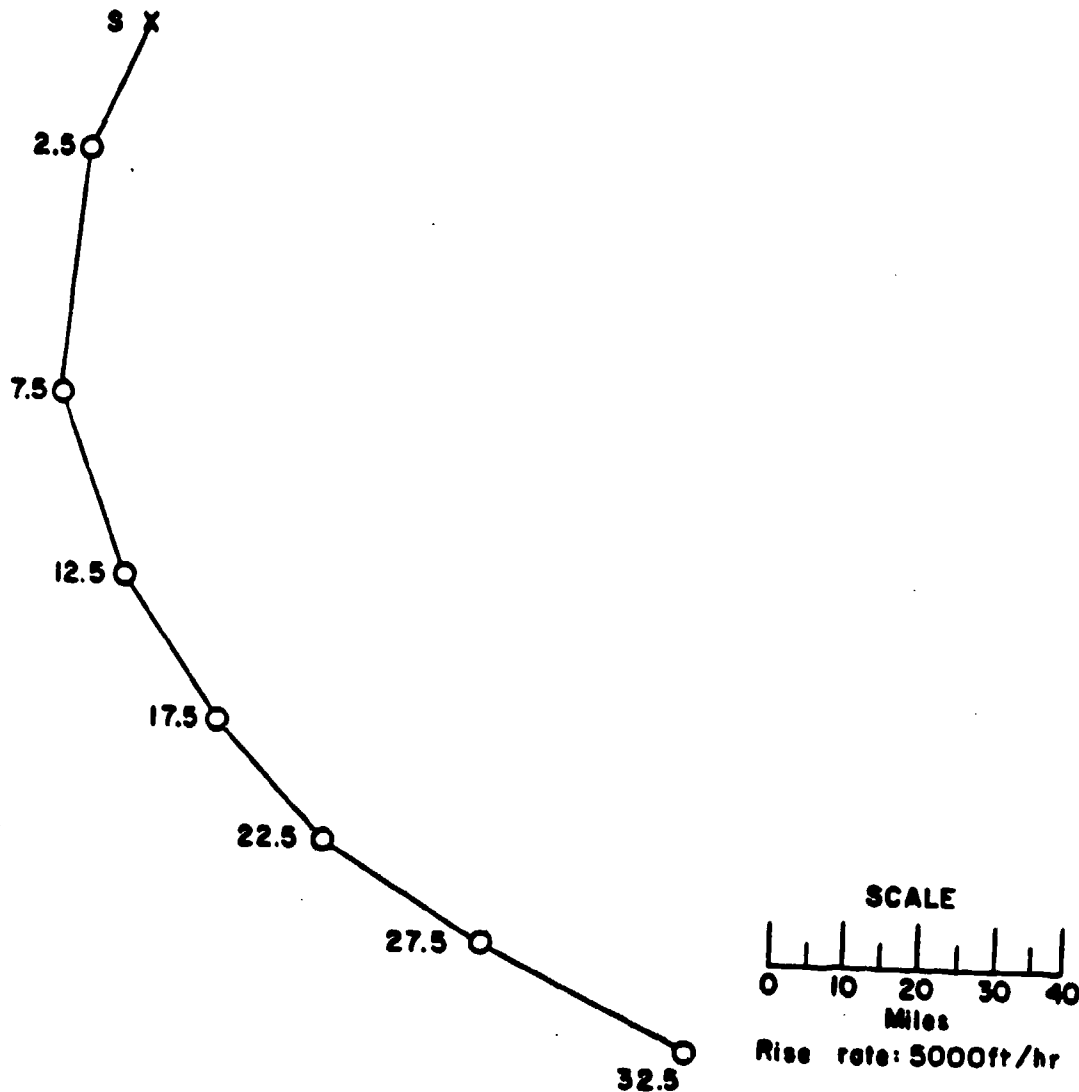


Figure 5. Hodograph for Operation TOTEM - Round 2.

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OPERATION MOSAIC - Round 1

GMI
DATE: 16 May 1956
TIME: 1130

SITE: Monte Bello Islands

HEIGHT OF BURST: 100 ft

TOTAL YIELD: [REDACTED]
FISSION YIELD: [REDACTED]

TYPE OF BURST AND PLACEMENT:
Tower burst over soil

GROUND TOP HEIGHT: [REDACTED]
GROUND BOTTOM HEIGHT: [REDACTED]

OPERATION MOSAIC - Round 2

GMI
DATE: 19 June 1956
TIME: 1014

SITE: Monte Bello Islands

HEIGHT OF BURST: 100 ft

TOTAL YIELD: [REDACTED]
FISSION YIELD: [REDACTED]

TYPE OF BURST AND PLACEMENT:
Tower burst over soil

GROUND TOP HEIGHT: [REDACTED]
GROUND BOTTOM HEIGHT: [REDACTED]

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~~FROM BURST AREA 1~~

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OPERATION BUFFALO - Round 1

DATE: 27 Sept 1956
TIME: 0730

SITE: Miralinga Proving Ground,
South Australia
30°S 131°E

TOTAL YIELD: [REDACTED]
FISSION YIELD: [REDACTED]

HEIGHT OF BURST: 100 ft

CLOUD TOP HEIGHT: [REDACTED]
CLOUD BOTTOM HEIGHT: [REDACTED]

TYPE OF BURST AND PLACEMENT:
Tower burst over Australian
soil

REMARKS:

The off-site dose-rate readings were taken between D+1 day and D+5 days by ground-survey teams with gamma-survey instruments, types 1390A and 1391A. Readings were taken at one-tenth mile intervals. Actual decay measurements were used to extrapolate the dose-rate readings to H+14 hours. The $t^{-1.2}$ decay approximation was used to extrapolate the H+14-hour dose-rate readings to H+1 hour. Type 1390A survey meter is a battery-operated ionization chamber instrument designed to measure gamma dose rates more accurately than standard radiac survey instruments. The field of view is a solid angle of nearly 4π and response is uniform, to within 6 percent, over an energy range from 65 keV to 2 MeV. The type 1391A survey meter is a beta-plus-gamma survey instrument. It is similar to the 1390A instrument and was used as the standard beta measuring instrument.

The crater region dose-rate readings were taken at D+10 days. The $t^{-1.2}$ decay approximation was used to extrapolate the readings to H+1 hour. Dust storms and heavy rain occurred during the week after the burst and the pattern is not considered to be reliable.

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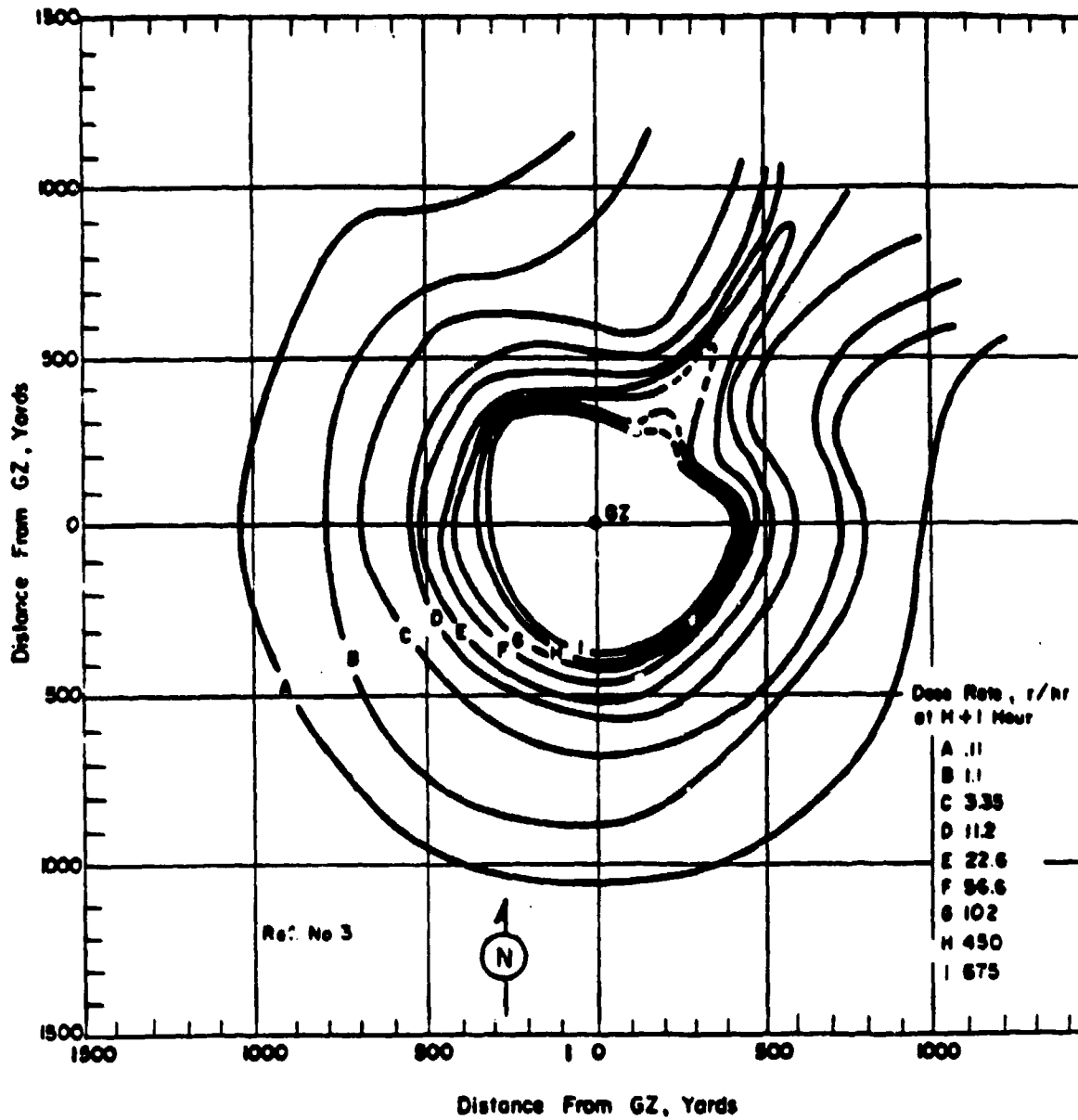


Figure 6. Operation BUFFALO - Round 1.
Crater region dose-rate contours in r/hr at H+1 hour.

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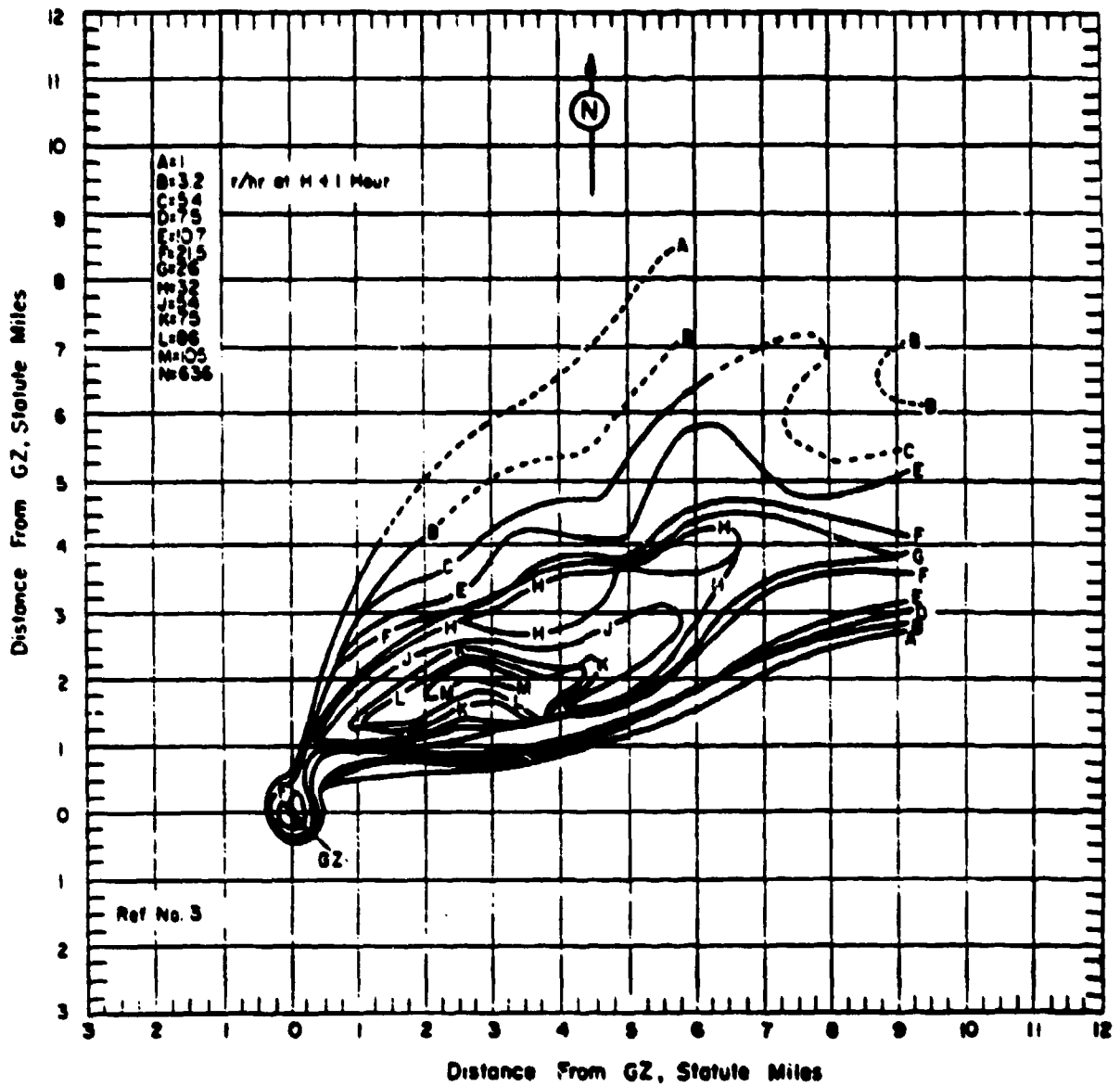


Figure 7. Operation BUFFALO - Round 1.
Off-site dose-rate contours in r/hr at H+1 hour.

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TABLE 4 WIND DATA FOR OPERATION BUFFALO - ROUND 1

Altitude (MSL) feet	Direction degrees	Speed mph
Surface	190	14
5,000	200	15
10,000	230	15
15,000	250	20
20,000	255	24
25,000	255	29
30,000	255	36
35,000	255	40
40,000	260	44

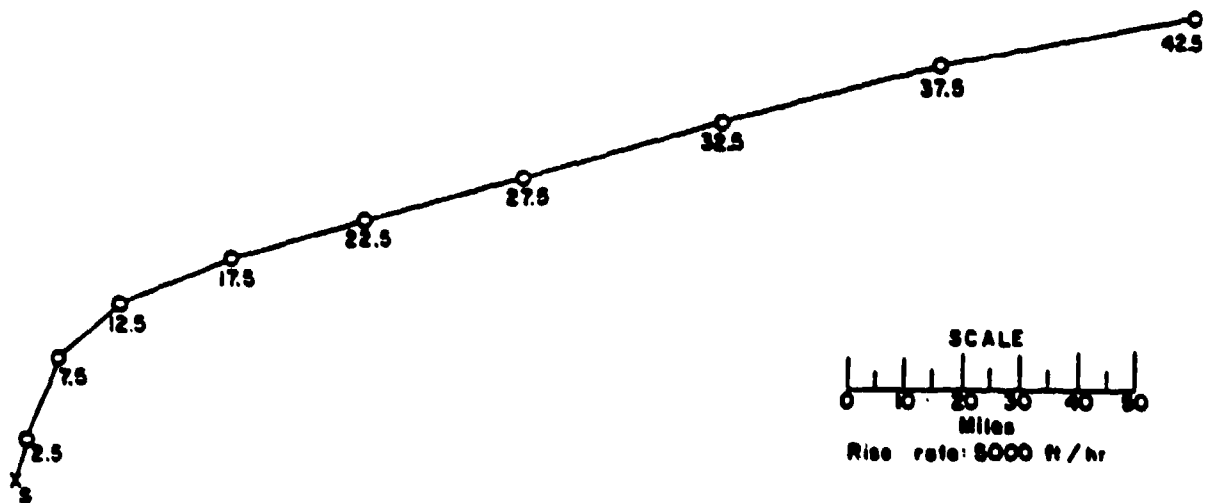


Figure 8. Hodograph for Operation BUFFALO - Round 1.



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OPERATION BUFFALO - Round 2

G.M.
DATE: 4 Oct 1956
TIME: 0700

SITE: Maralinga Proving Ground,
South Australia
30°S 131°E

TOTAL YIELD: [REDACTED]
FISSION YIELD: [REDACTED]

HEIGHT OF BURST: Surface

CLOUD TOP HEIGHT: [REDACTED]
Upper portion: [REDACTED]
CLOUD BOTTOM HEIGHT: [REDACTED]
Lower portion: [REDACTED]

TYPE OF BURST AND PLACEMENT:
Surface burst on Australian
soil

REMARKS:

The dose-rate readings were taken between D+1 day and D+4 days by ground-survey teams with gamma-survey instruments, types 1390A and 1391A, at one-tenth mile intervals. The type 1390A survey meter is a battery operated ionization chamber instrument. The field of view is a solid angle of nearly 4- and response is uniform, to within 8 percent, over an energy range from 65 KeV to 2 MeV. The type 1391 survey meter is a beta-plus-gamma survey instrument. It is similar to the 1390A instrument and was used as the standard beta measuring instrument. Laboratory decay measurements were used to extrapolate the dose-rate readings to H+24 hours; the $t^{-1.2}$ decay approximation was used to extrapolate the H+24-hour dose-rate readings to H-1 hour. The northeasterly part of the pattern was obtained by subtracting the contribution of the contamination from Round 1.

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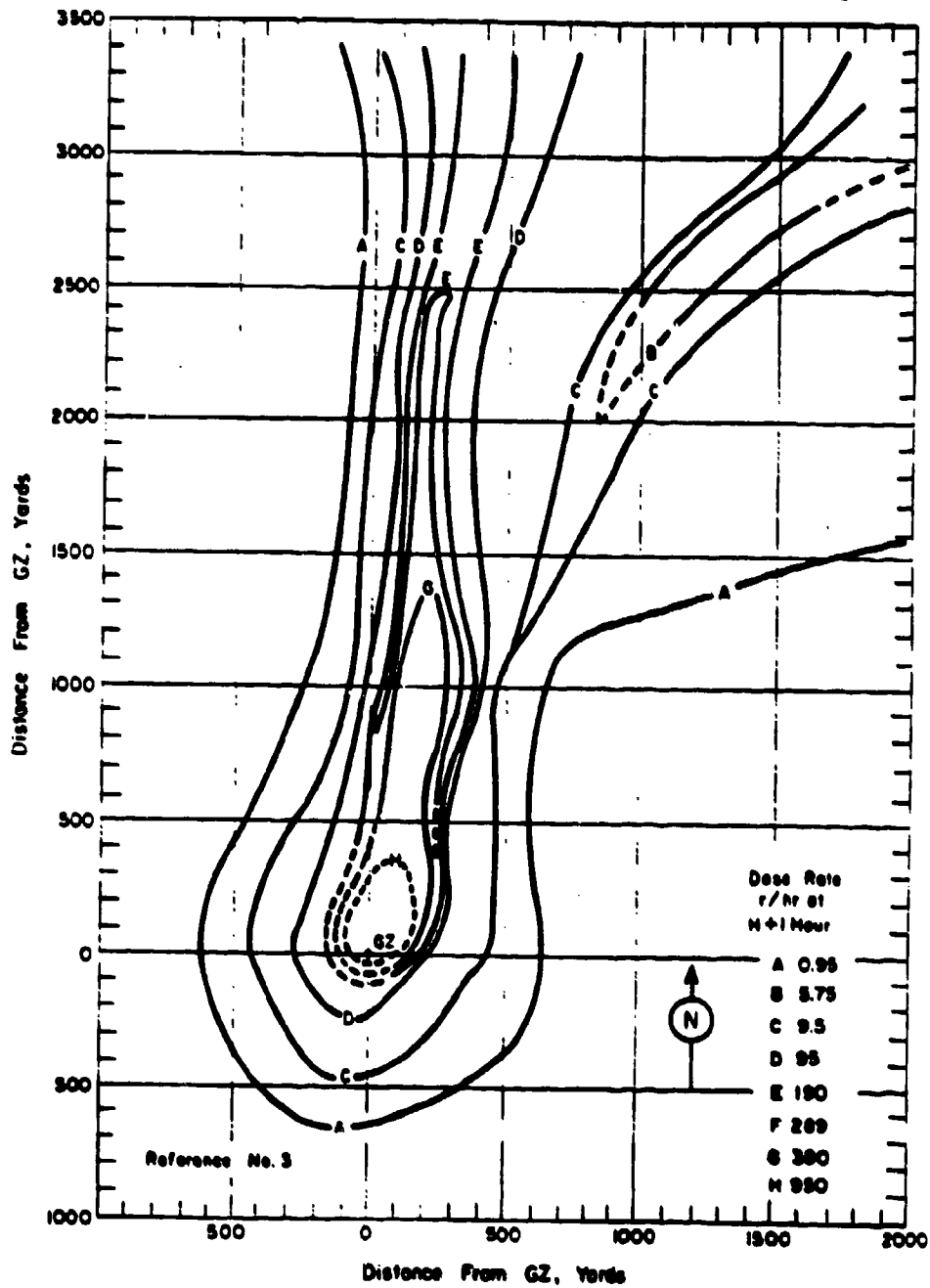


Figure 9. Operation BUFFALO - Round 2.
On-site dose-rate contours in r/hr at H+1 hour.

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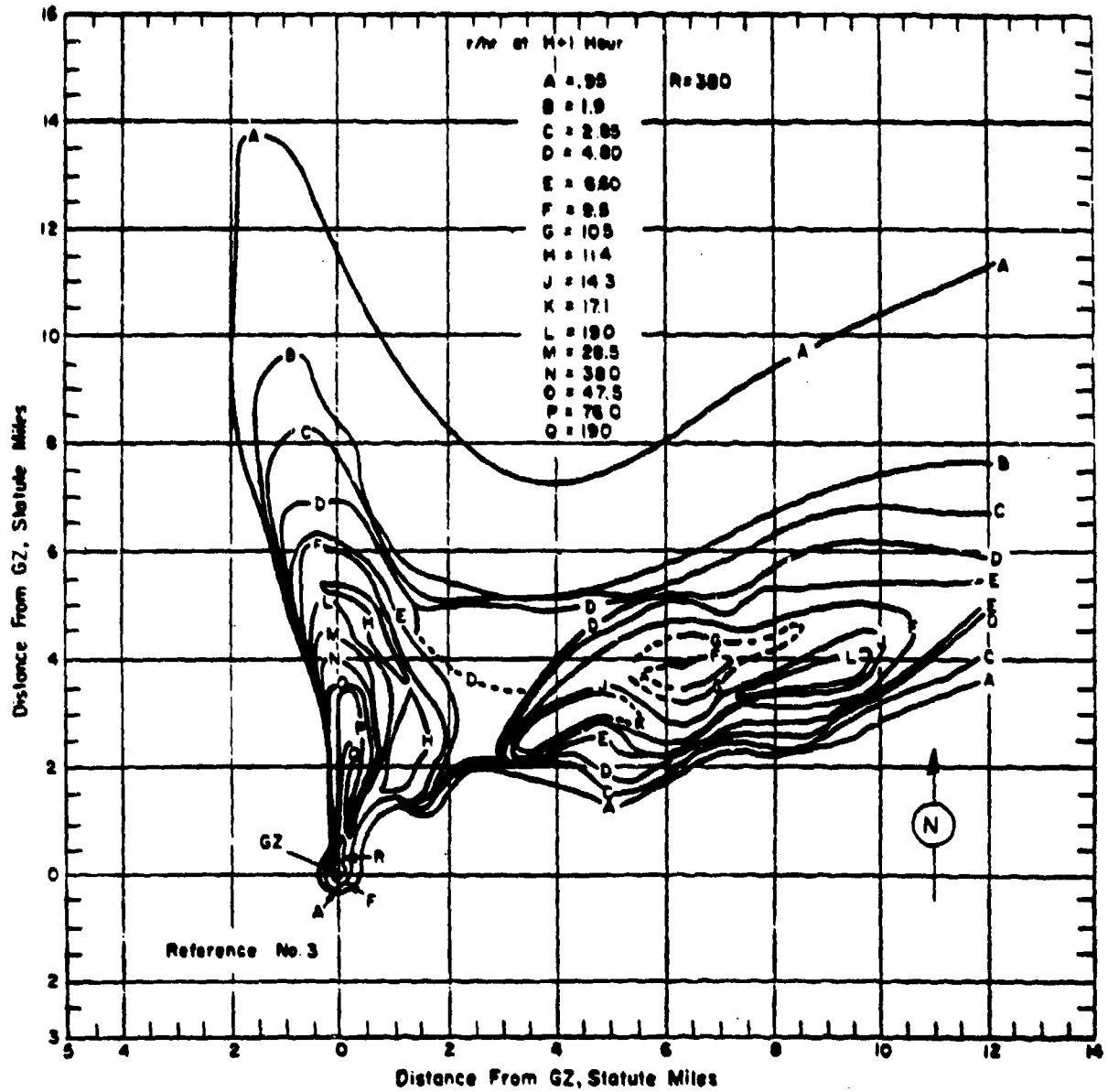


Figure 10. Operation BUFFALO - Round 2.
Off-site dose-rate contours in r/hr at H+1 hour.

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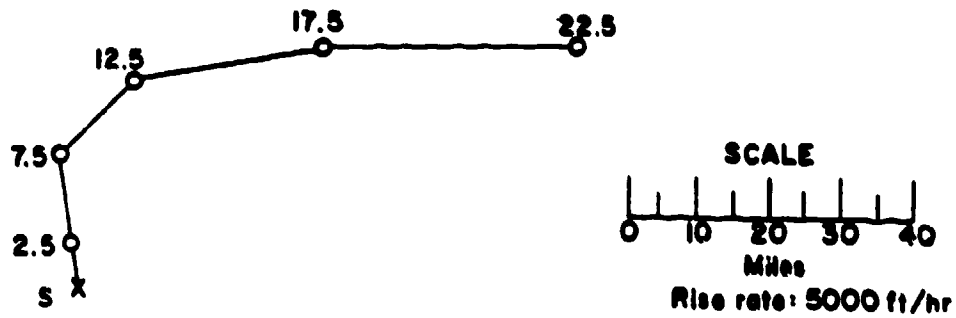


Figure 11. Hodograph for Operation BUFFALO - Round 2.

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OPERATION BUFFALO - Round 3

DATE: GMT
11 Oct 1956
TIME: 0600

SITE: Maralinga Proving Ground,
South Australia
30°S 131°E

TOTAL YIELD:
FISSION YIELD:

HEIGHT OF BURST: 500 ft

TYPE OF BURST AND PLACEMENT:
Air burst

REMARKS:

No detailed survey was made on the shot. Measurements were made at ground zero at H+1 hour, and the maximum dose rate recorded was 17 r/hr.

OPERATION BUFFALO - Round 4

DATE: GMT
21 Oct 1956
TIME: 1435

SITE: Maralinga Proving Ground,
South Australia
30°S 131°E

TOTAL YIELD:
FISSION YIELD:

HEIGHT OF BURST: 100 ft

CLOUD TOP HEIGHT:
CLOUD BOTTOM HEIGHT:
(estimates from aircraft of shot
fired in darkness)

TYPE OF BURST AND PLACEMENT:
Tower burst over Australian
soil

REMARKS:

The survey on this shot was performed as a military operation. An operational headquarters was set up and as the dose-rate readings were observed they were radioed to the military commander, converted to the H+1 hour reading, and plotted on a map. The instruments used were Victoreen No. 592 gamma survey meters. The $t_{1/2}$ decay approximation was used to convert the dose rates to H+1 hour.

The crater region survey was made on D+10 days by a military unit. The $t_{1/2}$ decay approximation was used to convert the dose rates to H+1 hour.

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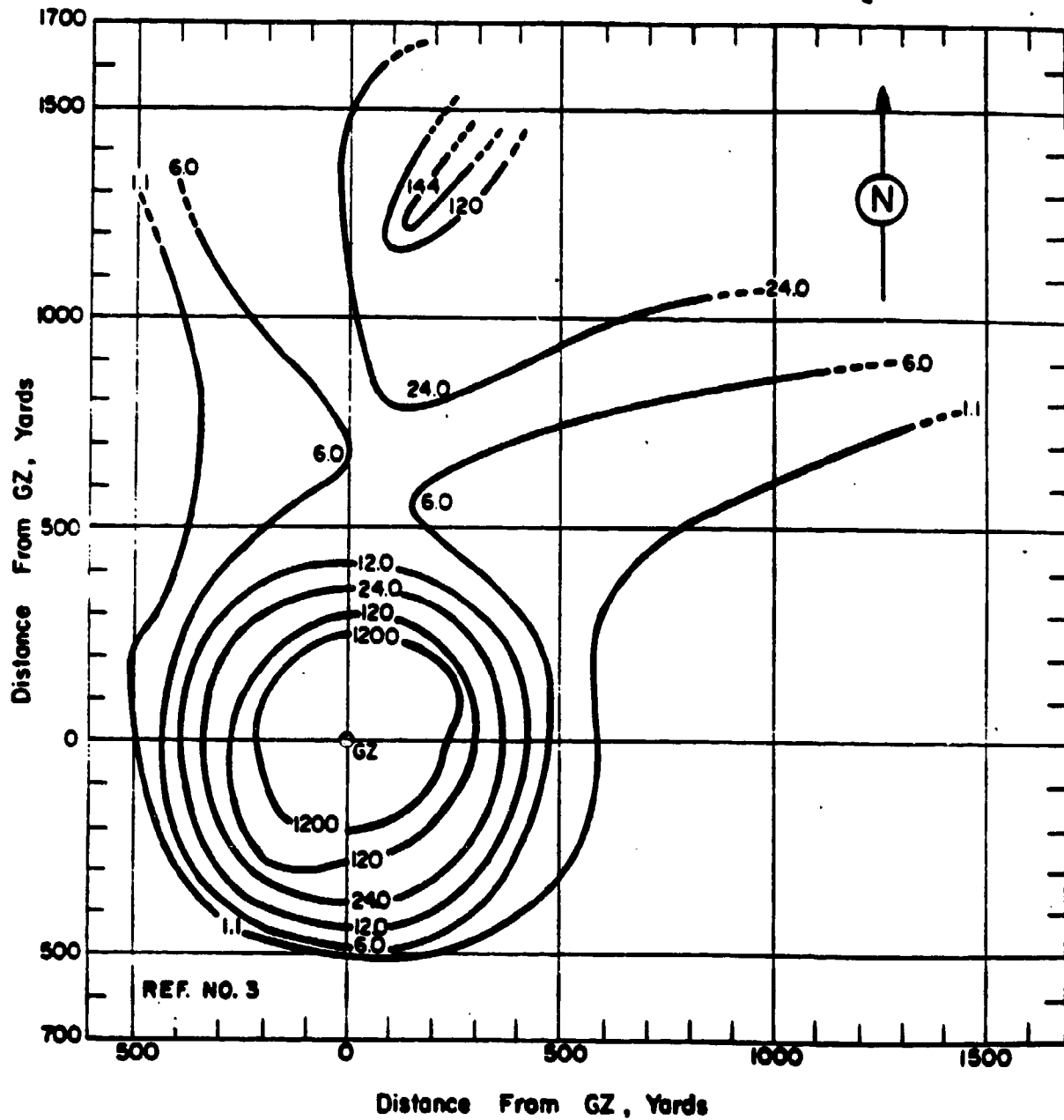


Figure 12. Operation BUFFALO - Round 4.
Crater region dose-rate contours in r/hr at H+1 hour.

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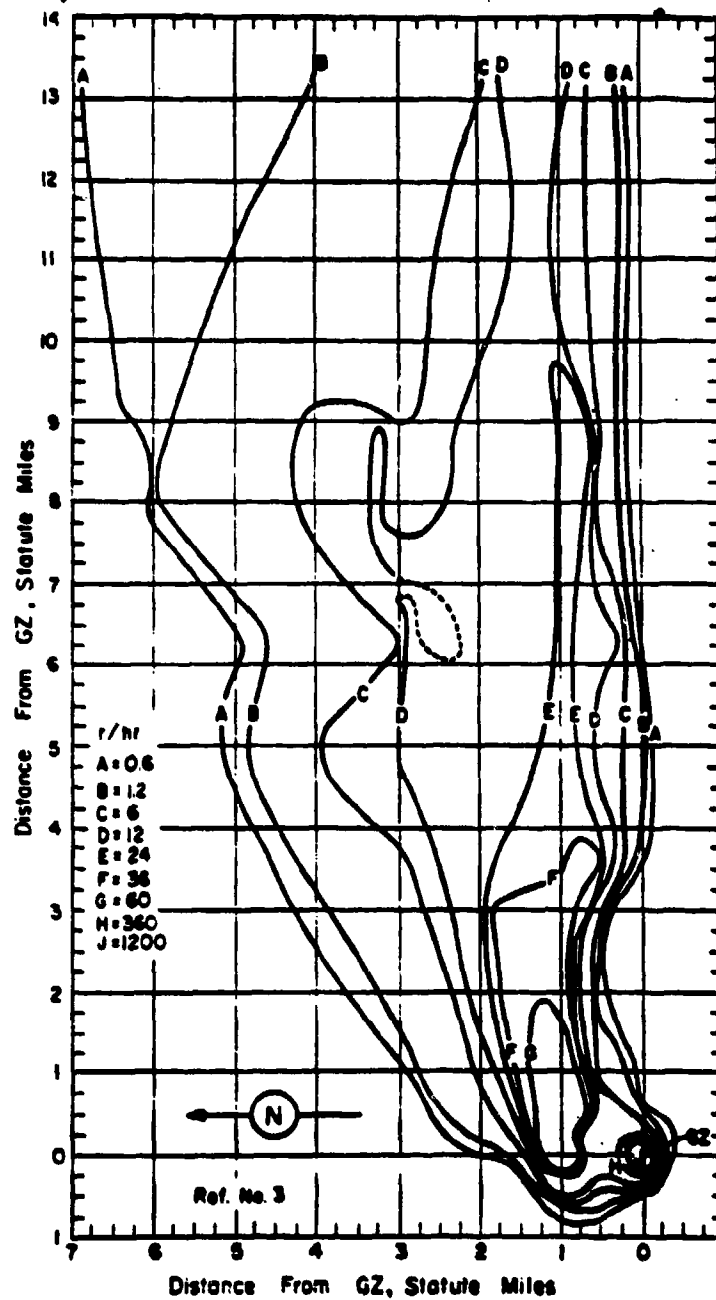


Figure 13. Operation BUFFALO - Round 4.
Off-site dose-rate contours in r/hr at H+1 hour.

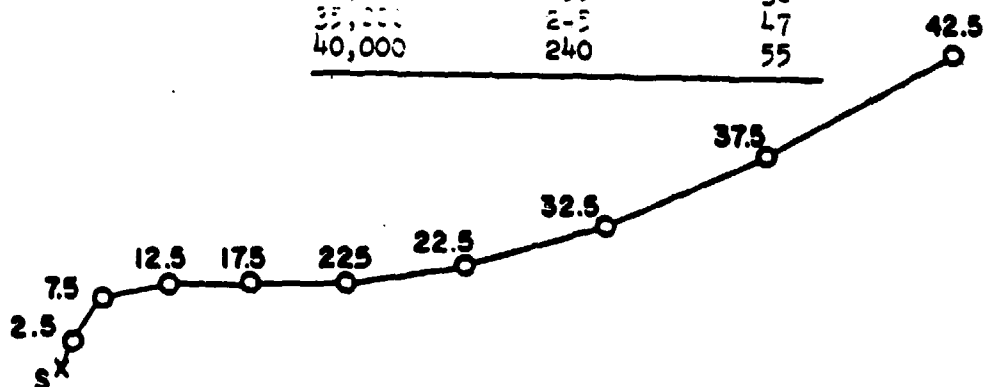
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TABLE 6 WIND DATA FOR OPERATION BUFFALO - ROUND 4

Altitude (MSL) feet	Direction degrees	Speed mph
Surface	180	12
5,000	210	12
10,000	260	16
15,000	270	21
20,000	270	26
25,000	260	33
30,000	255	38
35,000	255	47
40,000	240	55



SCALE
0 20 40 60
Miles
Rise rate: 5000ft/hr



Figure 14. Hodograph for Operation BUFFALO - Round 4.

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OPERATION GRAPPLE 1957 - Round 1

GMT
DATE: 15 May 1957
TIME: 1938

SITE: Christmas Island Area

HEIGHT OF BURST: [REDACTED]

TOTAL YIELD: [REDACTED]
FISSION YIELD: [REDACTED]

TYPE OF BURST AND PLACEMENT:
Air burst

OPERATION GRAPPLE 1957 - Round 2

GMT
DATE: 31 May 1957
TIME: 1942

SITE: Christmas Island Area

HEIGHT OF BURST: [REDACTED]

TOTAL YIELD: [REDACTED]
FISSION YIELD: [REDACTED]

TYPE OF BURST AND PLACEMENT:
Air burst

OPERATION GRAPPLE 1957 - Round 3

GMT
DATE: 19 June 1957
TIME: 1940

SITE: Christmas Island Area

HEIGHT OF BURST: [REDACTED]

TOTAL YIELD: [REDACTED]
FISSION YIELD: [REDACTED]

TYPE OF BURST AND PLACEMENT:
Air burst

OPERATION GRAPPLE 1957 - Round 4

GMT
DATE: 8 Nov 1957
TIME: 1746

SITE: Christmas Island Area

HEIGHT OF BURST: [REDACTED]

TOTAL YIELD: [REDACTED]
FISSION YIELD: [REDACTED]

TYPE OF BURST AND PLACEMENT:
Air burst

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OPERATION ANTLER - Round 1

GMT
DATE: 14 Sept 1957
TIME: 0505

SITE: Maralinga Proving Ground
South Australia

TOTAL YIELD: [REDACTED]
FISSION YIELD: [REDACTED]

HEIGHT OF BURST: 100 ft

CLOUD TOP HEIGHT: [REDACTED]
CLOUD BOTTOM HEIGHT: [REDACTED]

TYPE OF BURST AND PLACEMENT:
Tower burst over Australian
soil

OPERATION ANTLER - Round 2

GMT
DATE: 25 Sept 1957
TIME: 0030

SITE: Maralinga Proving Ground
South Australia

TOTAL YIELD: [REDACTED]
FISSION YIELD: [REDACTED]

HEIGHT OF BURST: 100 ft

CLOUD TOP HEIGHT: [REDACTED]
CLOUD BOTTOM HEIGHT: [REDACTED]

TYPE OF BURST AND PLACEMENT:
Tower burst over Australian
soil

OPERATION ANTLER - Round 3

GMT
DATE: 9 Oct 1957
TIME: 0645

SITE: Maralinga Proving Ground
South Australia

TOTAL YIELD: [REDACTED]
FISSION YIELD: [REDACTED]

HEIGHT OF BURST: 1,000 ft

CLOUD TOP HEIGHT: [REDACTED]
CLOUD BOTTOM HEIGHT: [REDACTED]

TYPE OF BURST AND PLACEMENT:
Air burst from balloon over
Australian soil

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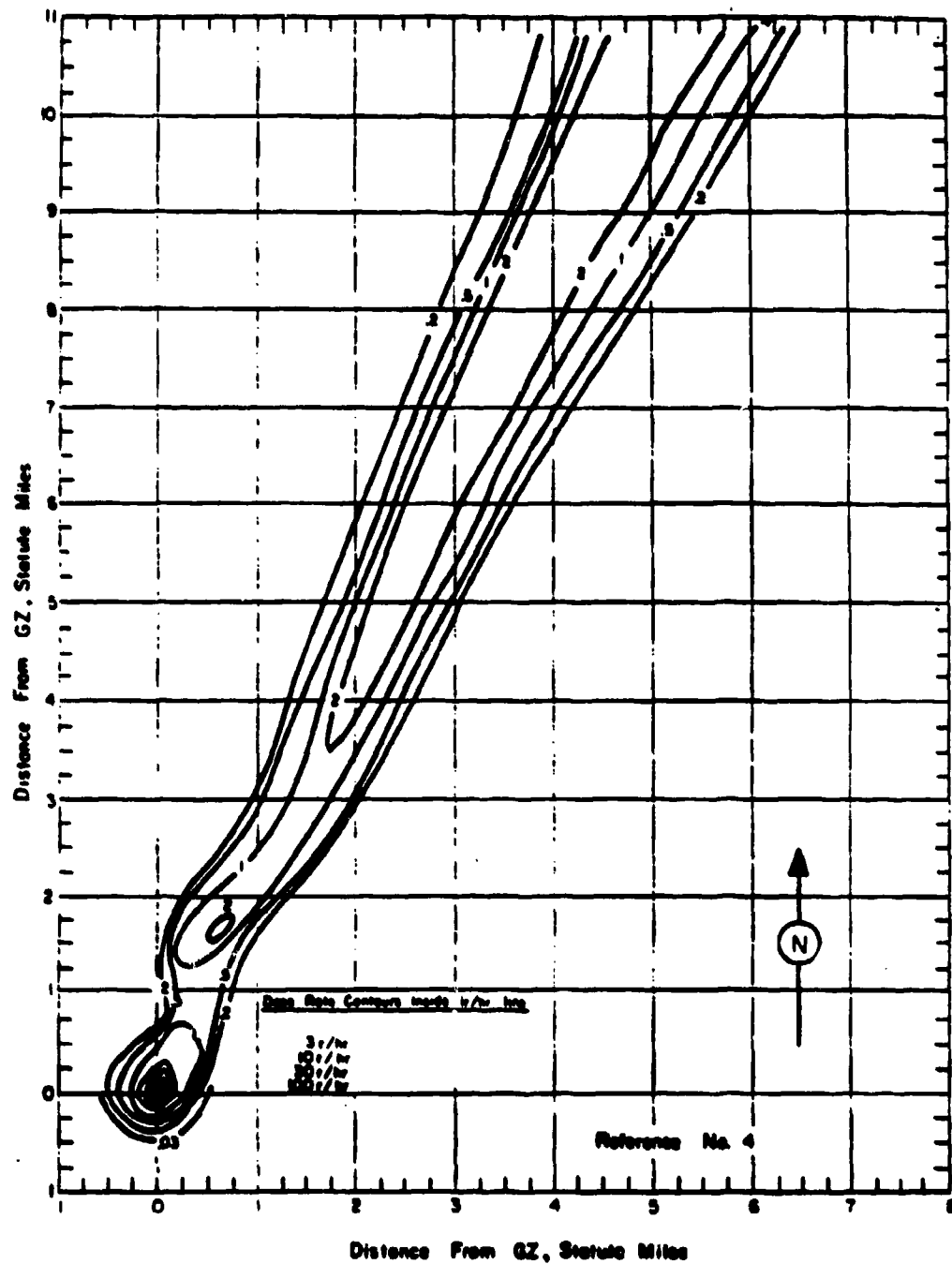


Figure 15. Operation ANTLER - Round 1.
On-site dose-rate contours in r/hr at H+1 hour.

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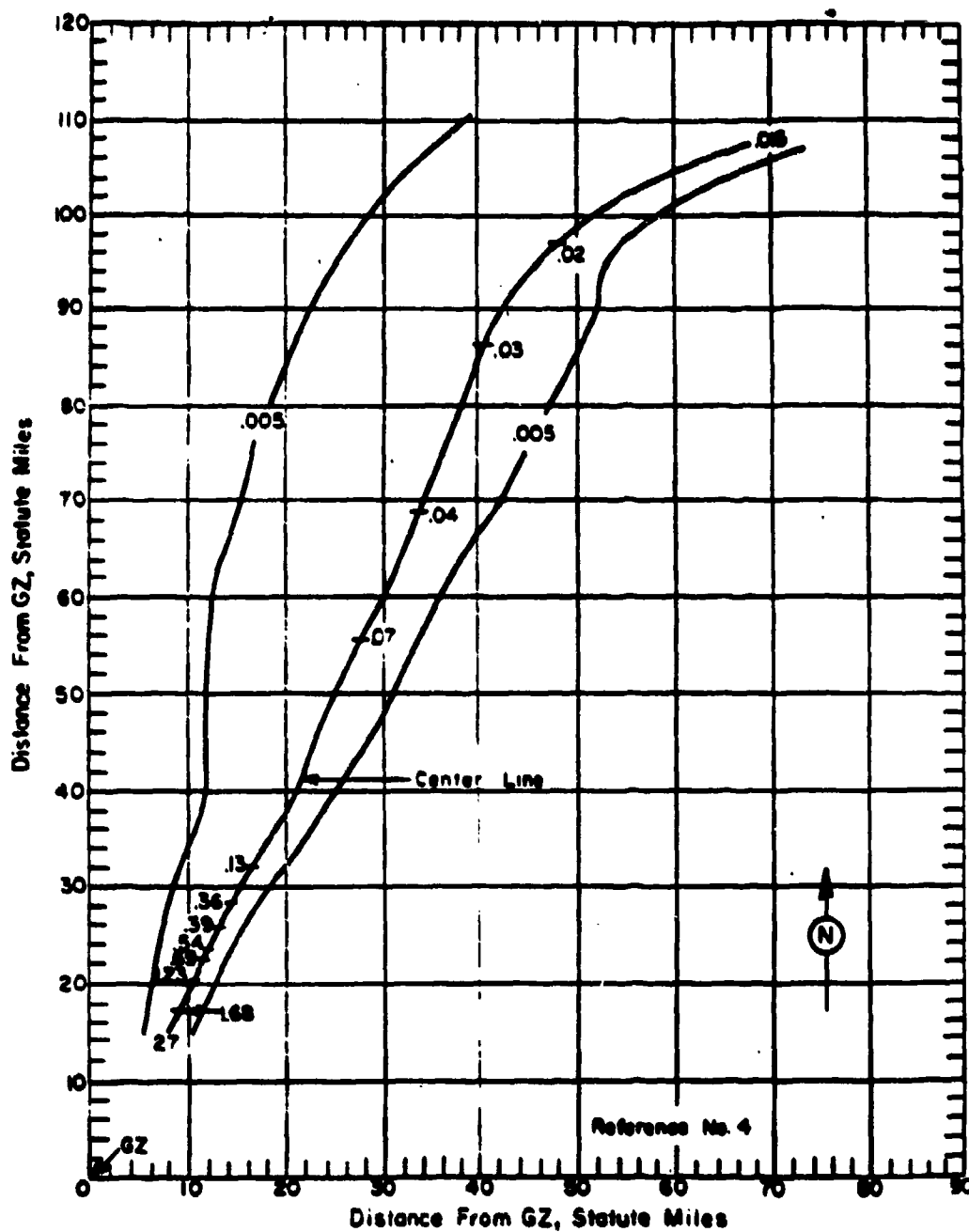


Figure 16. Operation ANTILER - Round 1
Off-site dose-rate contours in r/hr at H+1 hour.

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TABLE 7 WIND DATA FOR OPERATION ANTILER - ROUND 1

Altitude (MSL) feet	Direction degrees	Speed mph
Surface	---	--
2,500	209	24
5,000	216	28
7,500	214	26
10,000	211	30
12,500	216	33
15,000	224	37
17,500	229	39
20,000	232	42

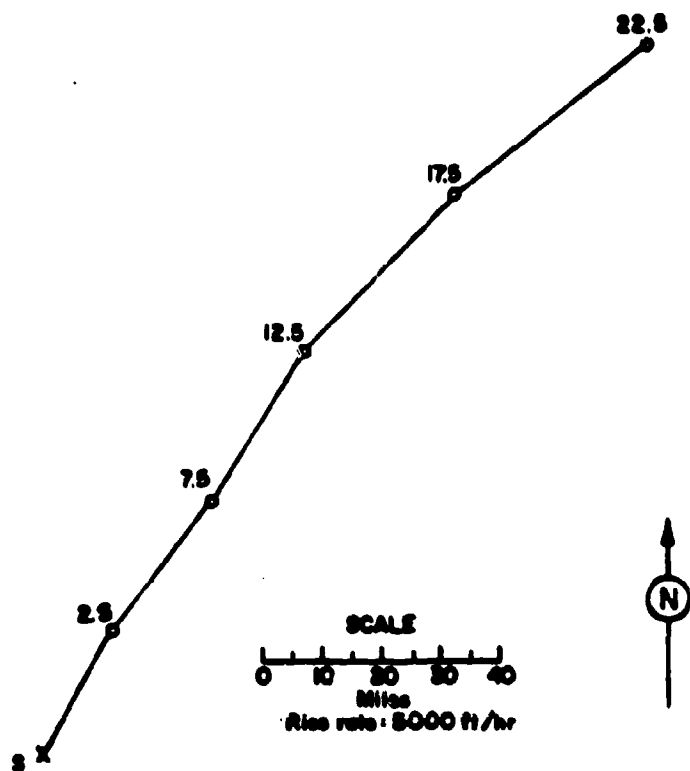


Figure 17. Hodograph for Operation ANTILER - Round 1.

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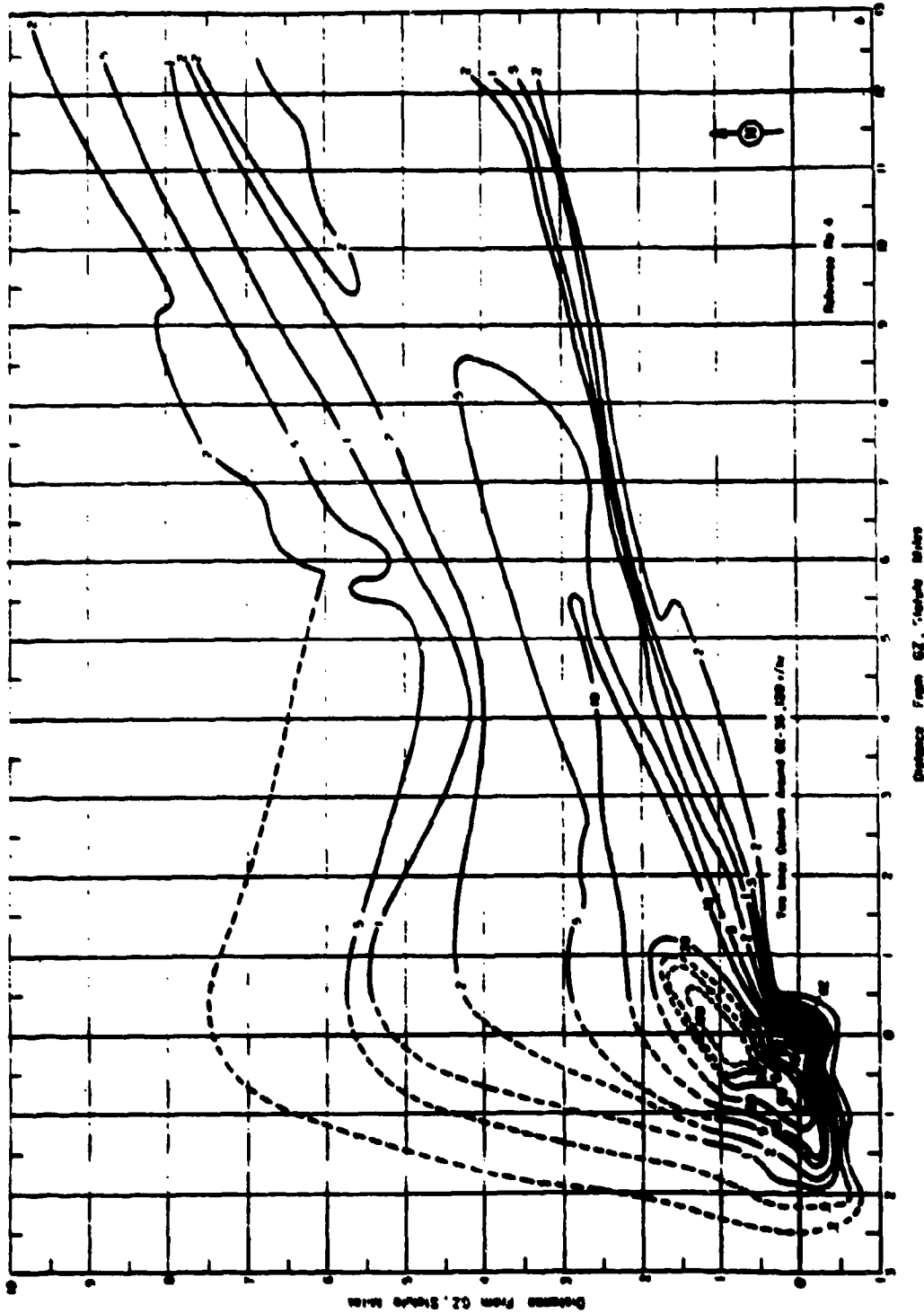


Figure 18. Operation ANTWERP - Round 2.
On-site close-rate contours: in r/hr at H+1 hour.

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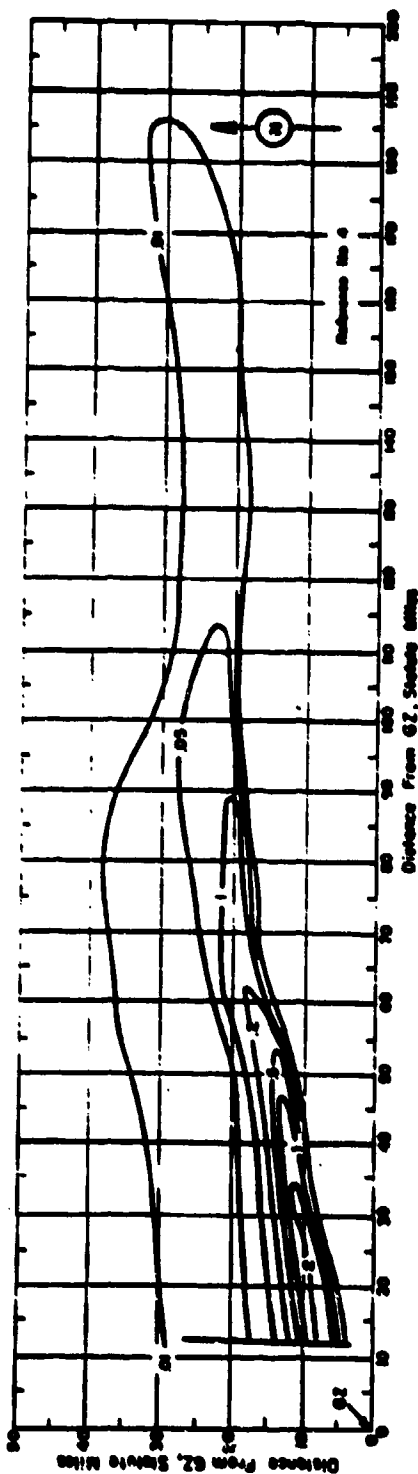


Figure 19. Operation ANTWERP - Round 2.
Off-site dose-rate contours in r/hr at H+1 hour.

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TABLE 4. WIND DATA FOR OPERATION ANTLER - ROUND 2

Altitude (MSL) feet	Direction degrees	Speed mph
Surface	---	---
5,000	73	1
7,500	201	6
10,000	203	9
12,500	241	15
15,000	245	18
17,500	250	22
20,000	253	27
22,500	252	31

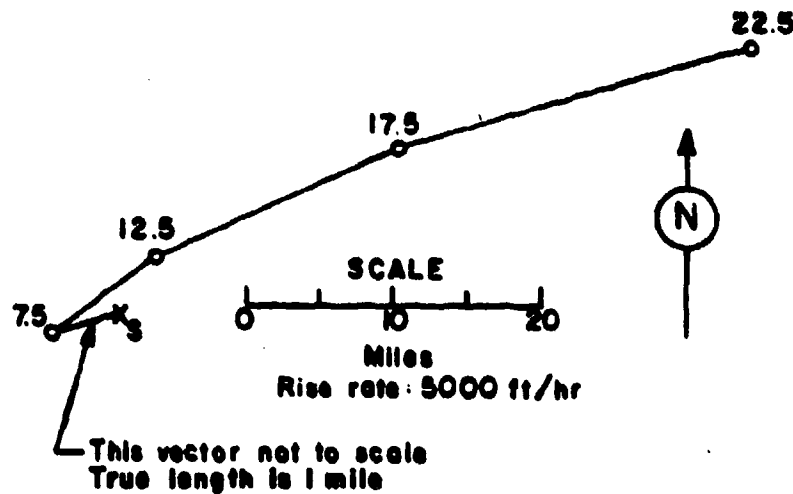


Figure 20. Hodograph for Operation ANTLER - Round 2.

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TABLE 9 WIND DATA FOR OPERATION ANTILER - ROUND 3

Altitude (MSL) feet	Direction degrees	Speed mph
Surface	---	--
2,500	241	13
5,000	247	10
7,500	270	22
10,000	280	26
12,500	285	31
15,000	282	36
17,500	284	39
20,000	255	42
22,500	282	51
25,000	277	63
30,000	280	56
39,000	275	68

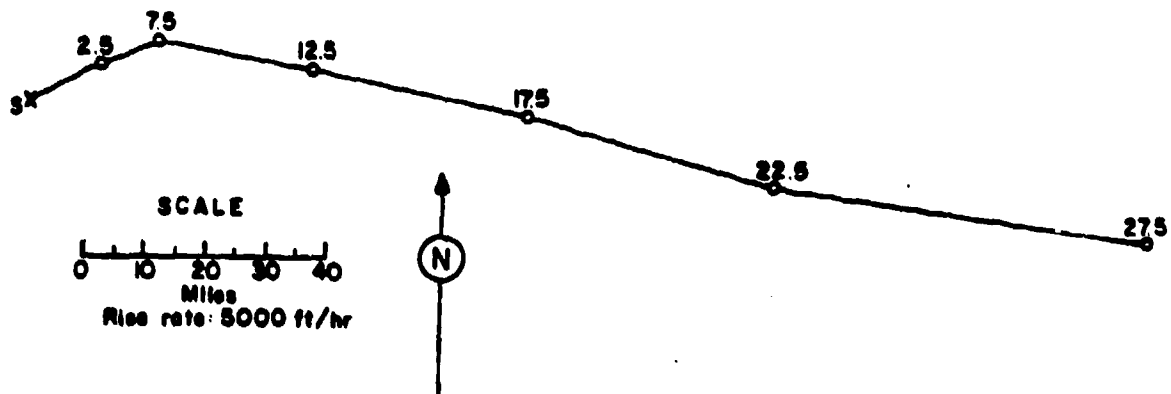


Figure 22. Hodograph for Operation ANTILER - Round 3.

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OPERATION GRAPPLE 1956 - Round 1

GMT
DATE: 28 Apr 1956
TIME: 1905

SITE: Christmas Island Area

HEIGHT OF BURST: [REDACTED]

TOTAL YIELD: [REDACTED]
FISSION YIELD: [REDACTED]

TYPE OF BURST AND PLACEMENT:
Air Drop

OPERATION GRAPPLE 1956 - Round 2

GMT
DATE: 28 Aug 1956
TIME: 1800

SITE: Christmas Island Area

HEIGHT OF BURST: [REDACTED]

TOTAL YIELD: [REDACTED]
FISSION YIELD: [REDACTED]

TYPE OF BURST AND PLACEMENT:
Air burst from balloon

OPERATION GRAPPLE 1956 - Round 3

GMT
DATE: 2 Sept 1956
TIME: 1724

SITE: Christmas Island Area

HEIGHT OF BURST: [REDACTED]

TOTAL YIELD: [REDACTED]
FISSION YIELD: [REDACTED]

TYPE OF BURST AND PLACEMENT:
Air drop

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OPERATION GRAPPLE 1958 - Round 4

DATE: GMT
11 Sept 1958
TIME: 1748

TOTAL YIELD:
FISSION YIELD:

SITE: Christmas Island Area

HEIGHT OF BURST:

TYPE OF BURST AND PLACEMENT:
Air drop

OPERATION GRAPPLE 1958 - Round 5

DATE: GMT
23 Sept 1958
TIME: 1800

TOTAL YIELD:
FISSION YIELD:

SITE: Christmas Island Area

HEIGHT OF BURST:

TYPE OF BURST AND PLACEMENT:
Air burst from balloon

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B. Republic of France Detonations

41

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OPERATION GERBOISE BLEUE

Local Time
DATE: 15 Feb 1960
TIME: 0700

TOTAL YIELD: [REDACTED]

SITE: Reggane, Central Algeria

HEIGHT OF BURST: 350 ft

PLACEMENT: Tower

OPERATION GERBOISE BLANCHE

Local Time
DATE: 1 Apr 1960
TIME: 0615

TOTAL YIELD: [REDACTED]

SITE: Reggane, Central Algeria

PLACEMENT: Surface

OPERATION GERBOISE ROUGE

Local Time
DATE: 27 Dec 1960
TIME: 0730

TOTAL YIELD: [REDACTED]

SITE: Reggane, Central Algeria

HEIGHT OF BURST: 350 ft

PLACEMENT: Tower

OPERATION GERBOISE VERTE

Local Time
DATE: 27 Apr 1961
TIME: 0500

TOTAL YIELD: [REDACTED]

SITE: Reggane, Central Algeria

HEIGHT OF BURST: Not available

PLACEMENT: Tower

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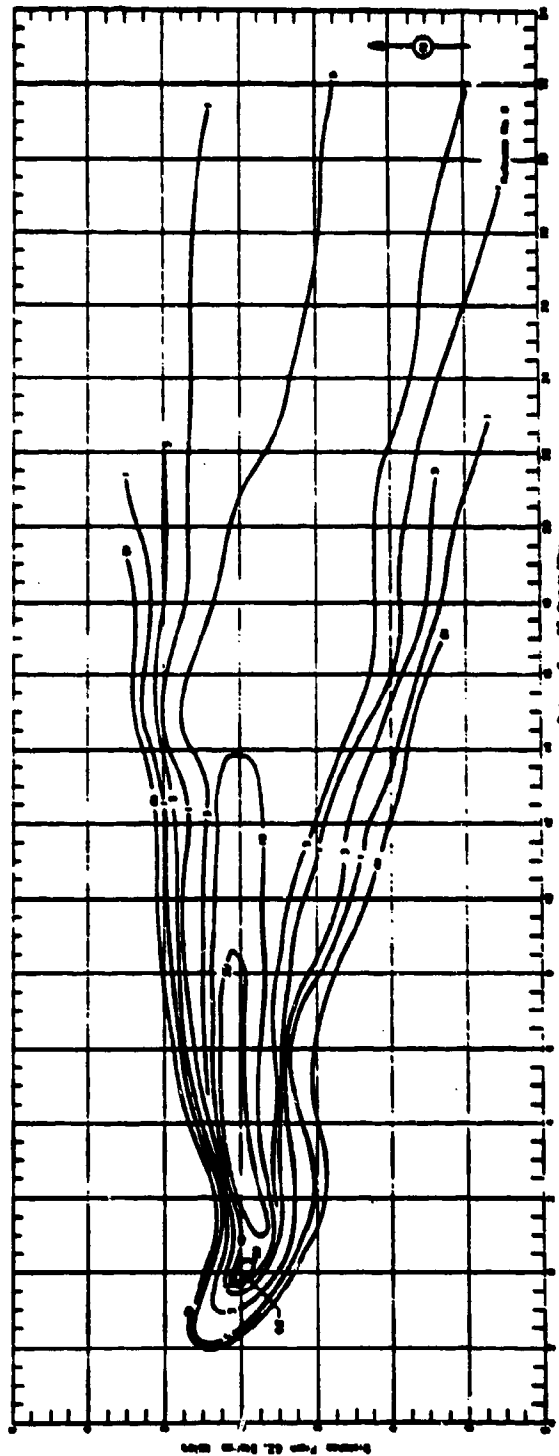


Figure 23. Operation GERBOISE BLEUE.
On-site dose-rate contours in r/hr at H+1 hour.

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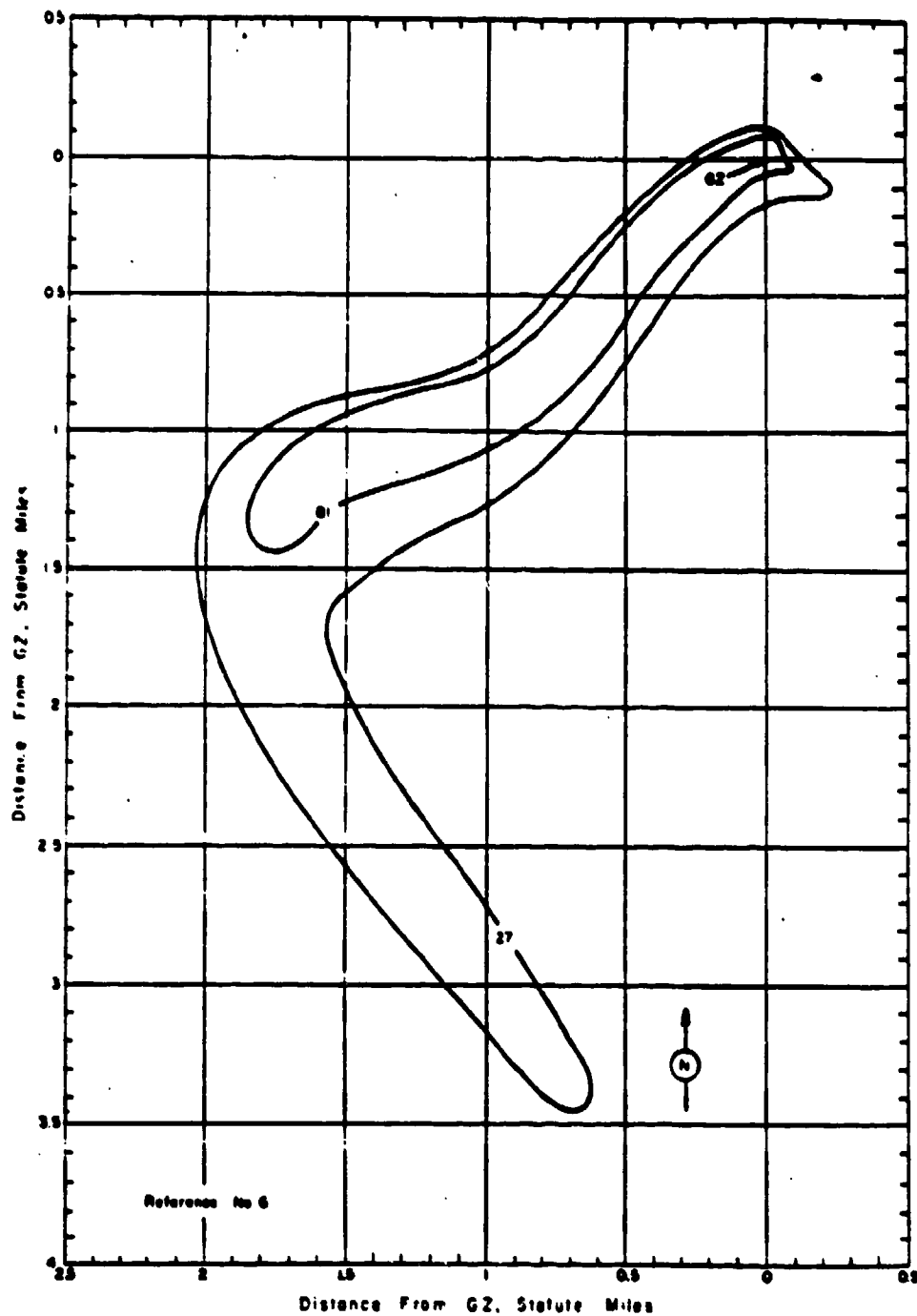


Figure 24. Operation GERBOISE BLANCHE.
On-site dose-rate contours in r/hr at H+1 hour.

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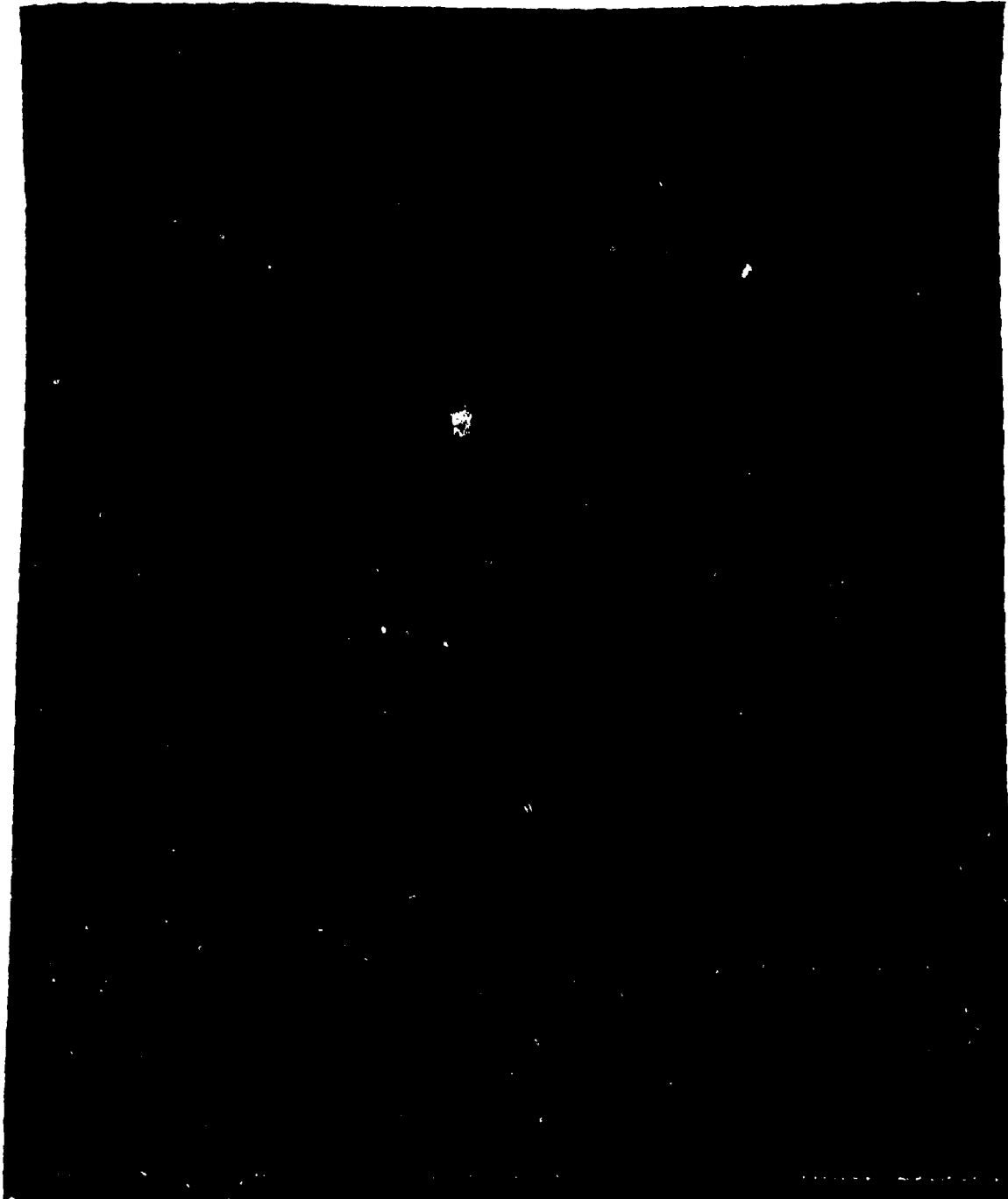


Figure 25. Operation GERBOISE BLANCHE.
Off-site dose-rate contours in r/hr at H-1 hour.

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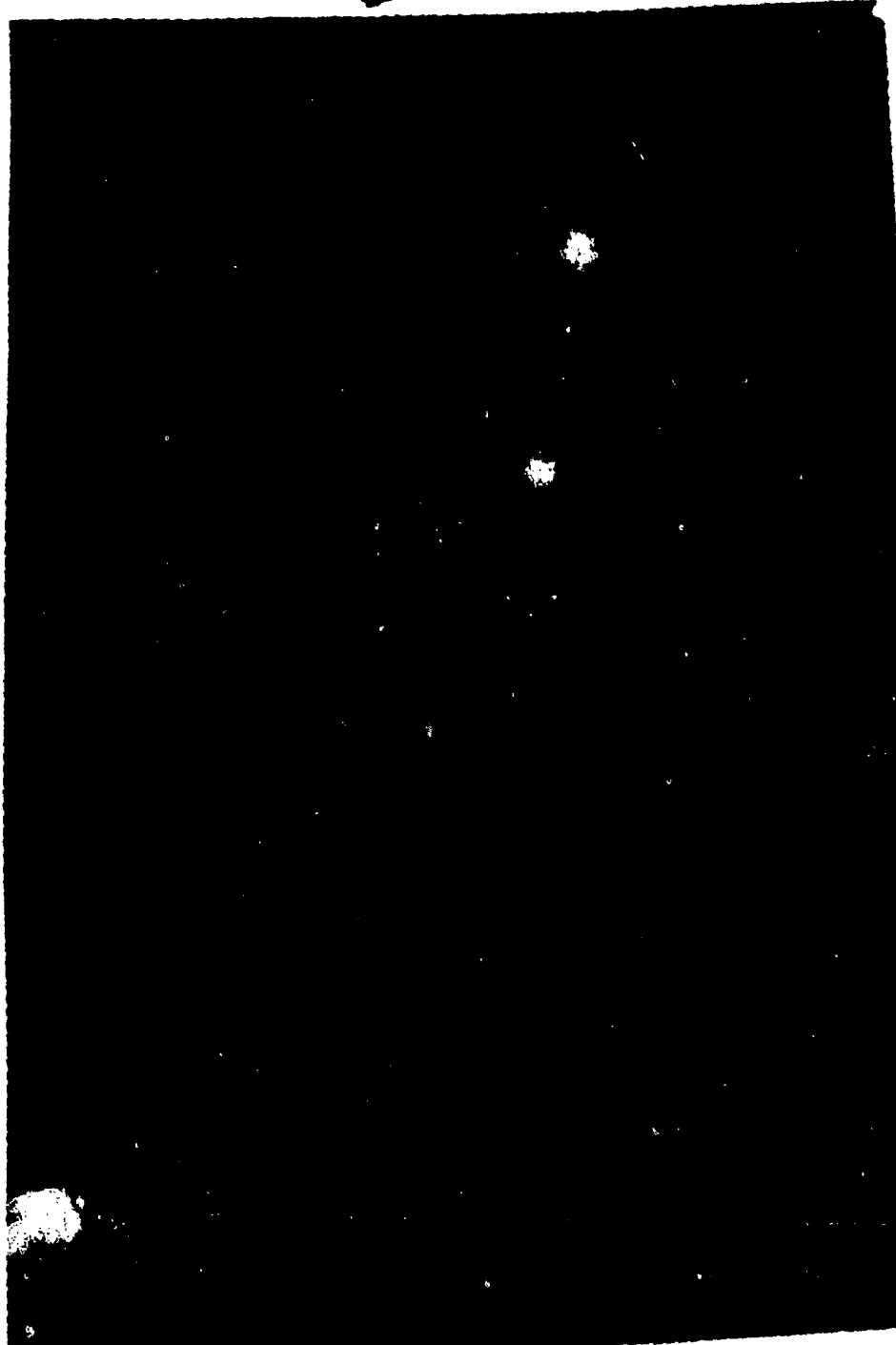


Figure 26. Operation GERBOISE ROUGE.
On-site dose-rate contours in r/hr at H+1 hour.

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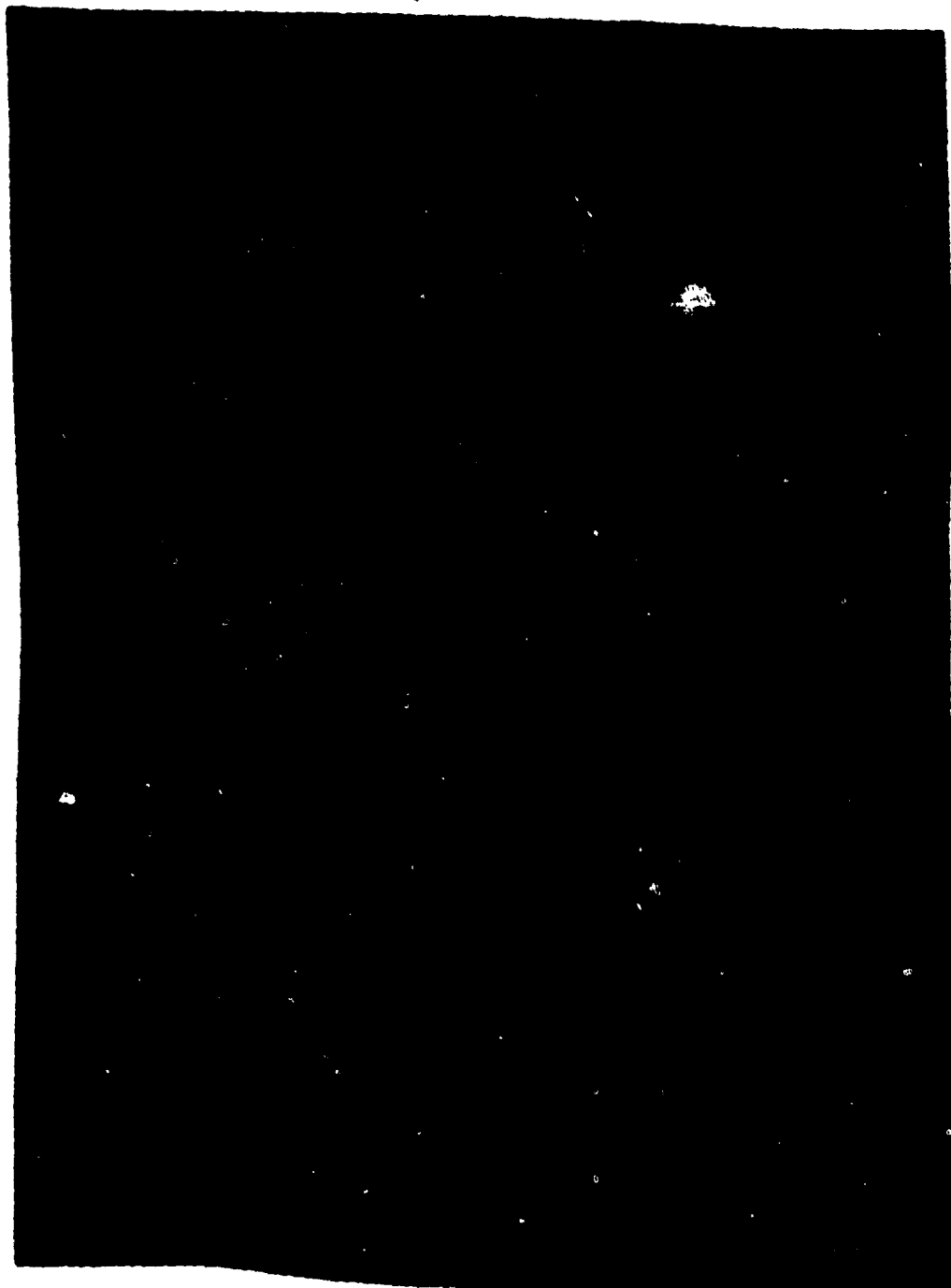


Figure 27. Operation GERBOISE ROUGE.
Off-site dose-rate contours in r/hr at H-1 hour.

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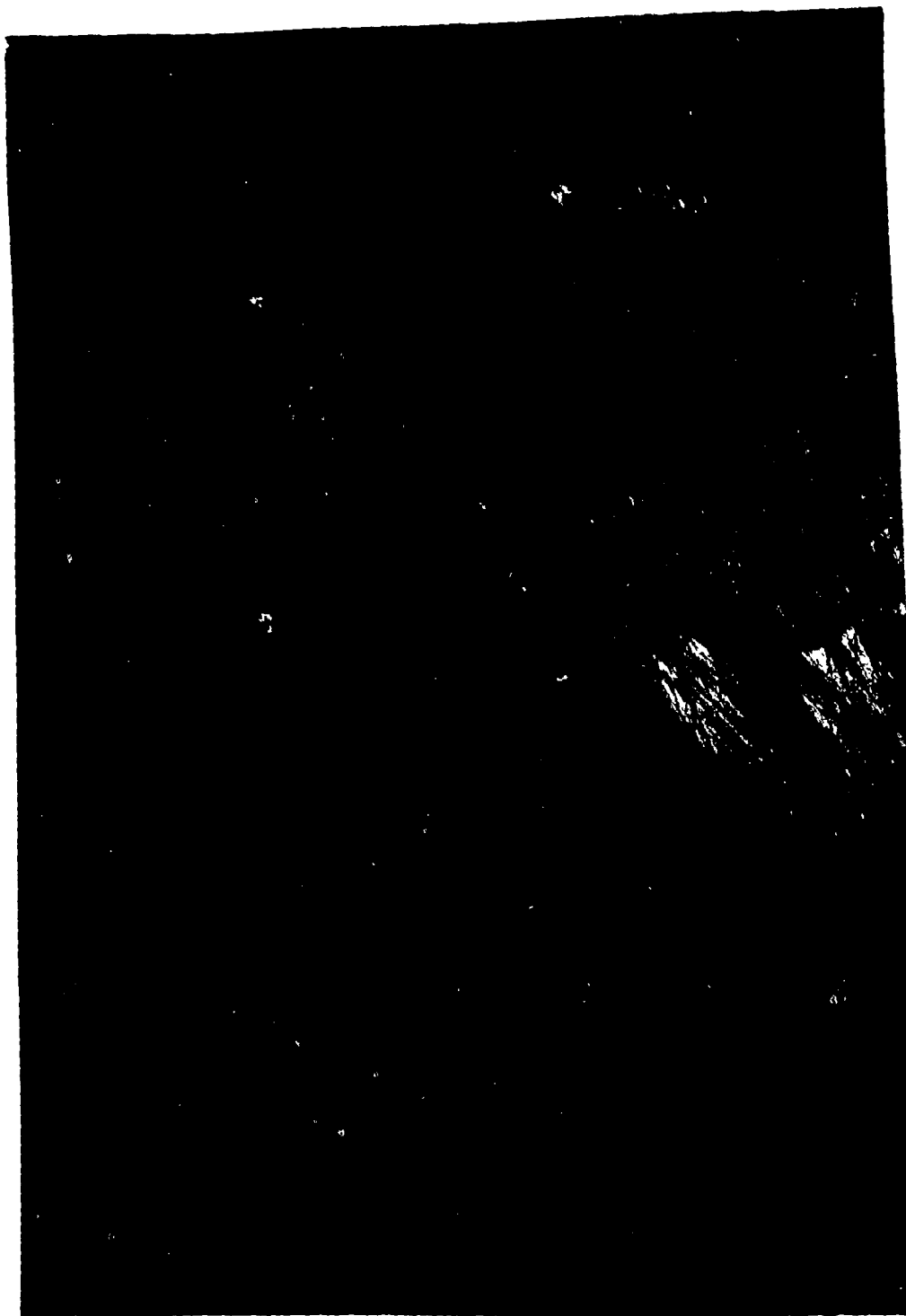


Figure 101. Operation GEORGE VERTU.
On-site damage report, October 10, 1964, 101 hours.

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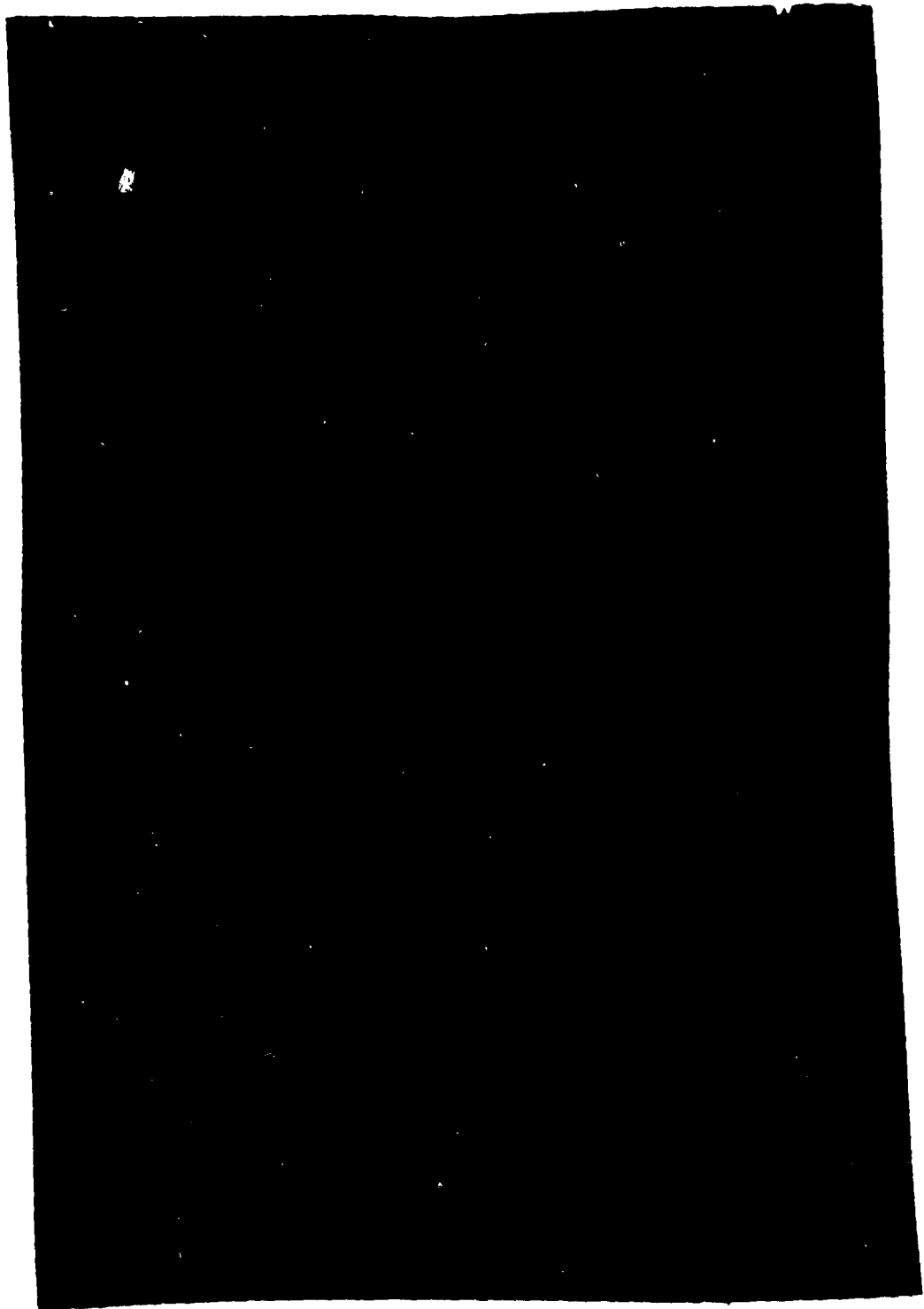


Figure 29. Operation GEMHOISE VERTE.
Off-site dose-rate contours in r/hr at 100 hour.

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C. Union of Soviet Socialist Republics

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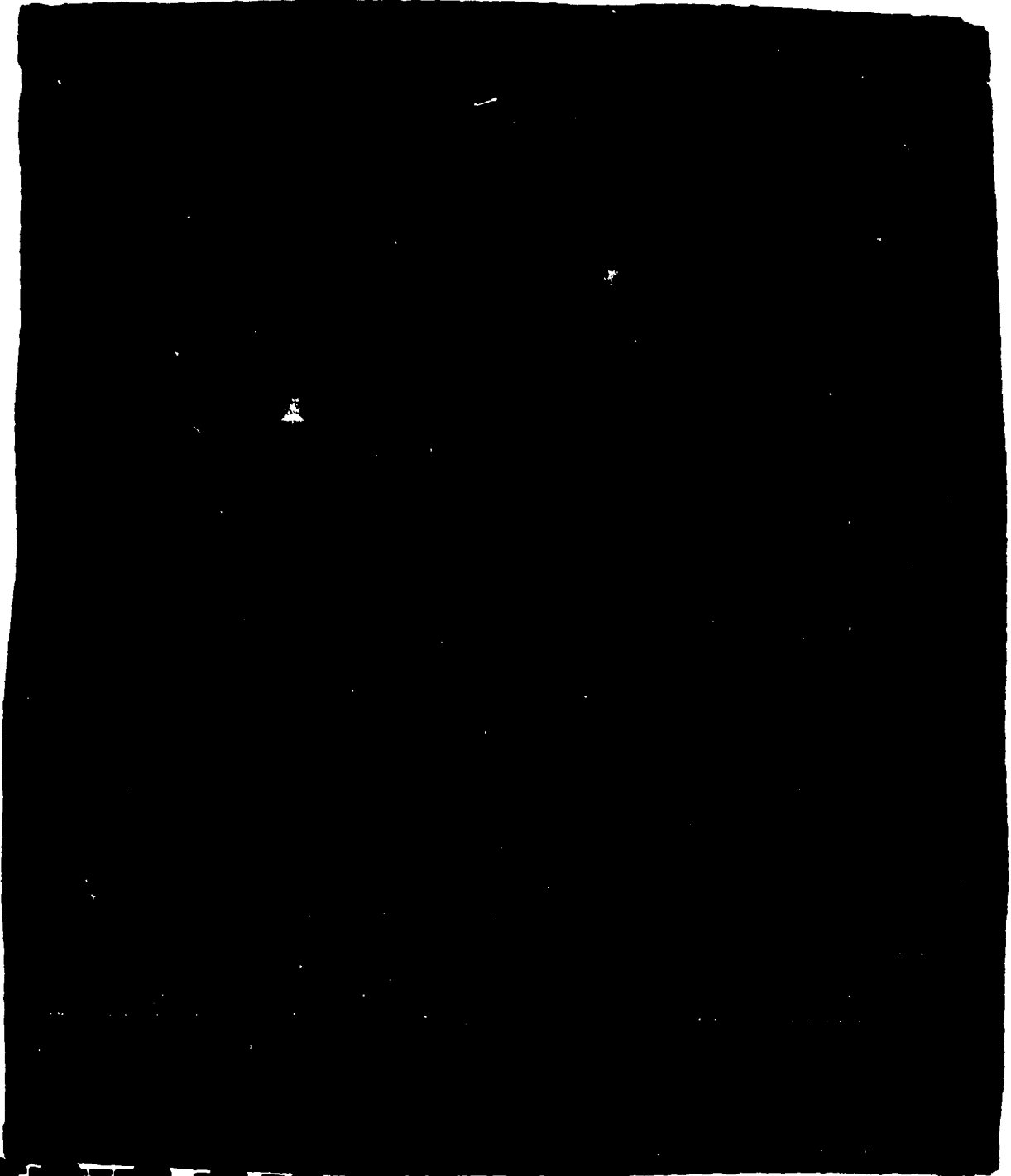
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Information Tabulated for Union of Soviet Socialist Republics Detonations

USSR Tests



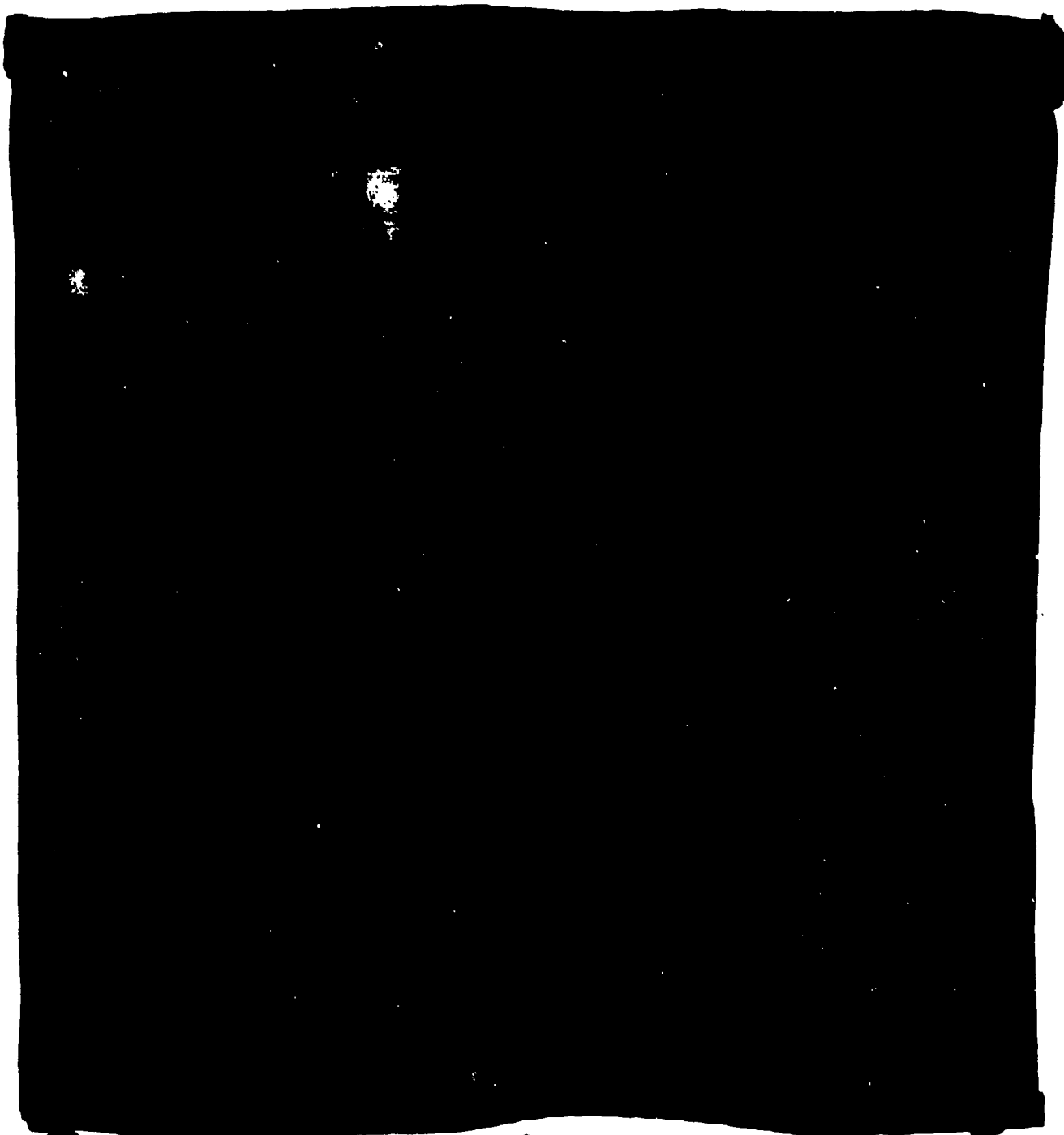
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Tabulated USSR Information (Continued)

USSR Tests (Continued)

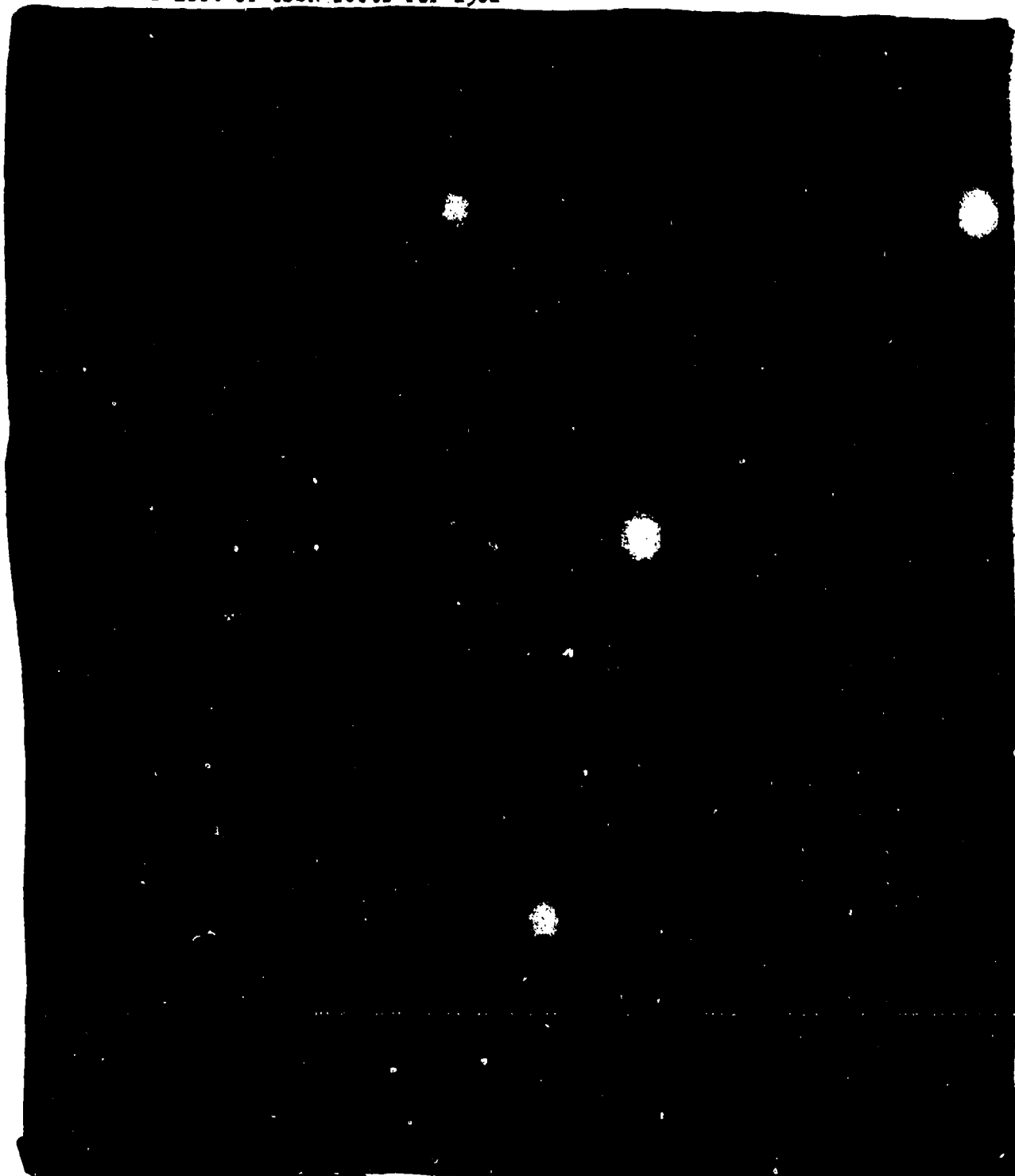


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Partial List of USSR Tests for 1962



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APPENDICES

A. Chronological Summaries of Nuclear Tests.

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1. CHRONOLOGICAL SUMMARY OF UNITED KINGDOM TESTS

Shot No.	Date	Time (GMT)	Operation	Round No.	Yield		Type	Site
					Total	Yield		
1	2 Oct 1952	23:09	Hurricane	Round 1			Shallow Underwater	Monte Bello Islands
2	14 Oct 1953	21:30	Totem	Round 1			Tower-100 ft	Emu Flats, S. Australia
3	26 Oct 1953	21:30	Totem	Round 2			Tower-100 ft	Emu Flats, S. Australia
4	16 May 1956	11:39	Mosaic	Round 1			Tower-100 ft	Monte Bello Islands
5	19 Jun 1956	10:14	Mosaic	Round 2			Tower-100 ft	Monte Bello Islands
6	27 Sep 1956	07:30	Buffalo	Round 1			Tower-100 ft	MTG, South Australia
7	4 Oct 1956	07:00	Buffalo	Round 2			Surface	MTG, South Australia
8	11 Oct 1956	06:00	Buffalo	Round 3			Air - 500 ft	MTG, South Australia
9	21 Oct 1956	14:35	Buffalo	Round 4			Tower-100 ft	MTG, South Australia
10	15 May 1957	19:23	Grapple 1957	Round 1			Air-8,000 ft	Christmas Island Area
11	31 May 1957	19:12	Grapple 1957	Round 2			Air-8,000 ft	Christmas Island Area
12	19 Jun 1957	19:10	Grapple 1957	Round 3			Air-8,000 ft	Christmas Island Area
13	14 Sep 1957	05:05	Antler	Round 1			Tower-100 ft	MTG, South Australia
14	25 Sep 1957	00:30	Antler	Round 2			Tower-100 ft	MTG, South Australia
15	9 Oct 1957	06:45	Antler	Round 3			Air-1,000 ft	MTG, South Australia
16	8 Nov 1957	17:43	Grapple 1957	Round 4			Air-8,000 ft	Christmas Island Area
17	28 Apr 1958	19:05	Grapple 1958	Round 1			Air-8,500 ft	Christmas Island Area
18	22 Aug 1958	18:00	Grapple 1958	Round 2			Air-1,500 ft	Christmas Island Area
19	2 Sep 1958	17:24	Grapple 1958	Round 3			Air-9,500 ft	Christmas Island Area
20	11 Sep 1958	17:48	Grapple 1958	Round 4			Air-8,500 ft	Christmas Island Area
21	23 Sep 1958	18:00	Grapple 1958	Round 5			Air-1,500 ft	Christmas Island Area

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2. CHRONOLOGICAL SUMMARY OF REPUBLIC OF FRANCE TESTS

Shot No.	Date	Local		Shot Code Name	Yield kt	Type	Site
		Time					
1	13 Feb 1960	0700		Gerboise Bleue	60 to 70	350 ft Tower	Reggane, Central Algeria
2	1 Apr 1960	0615		Gerboise Blanche		Surface	Reggane, Central Algeria
3	27 Dec 1960	0730		Gerboise Rouge		350 ft Tower	Reggane, Central Algeria
4	25 Apr 1961	0500		Gerboise Verte		Tower	Reggane, Central Algeria

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B. Location Maps of Test Sites.

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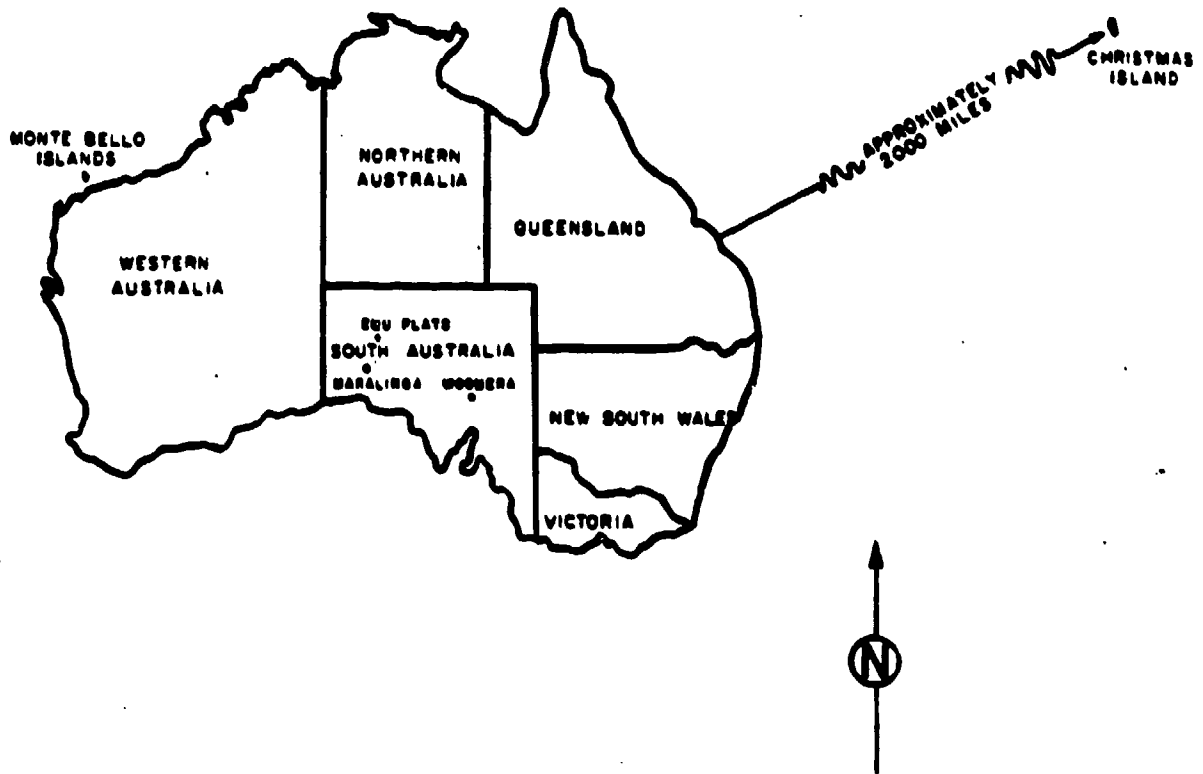


Figure 30. Location Map of United Kingdom Test Sites.

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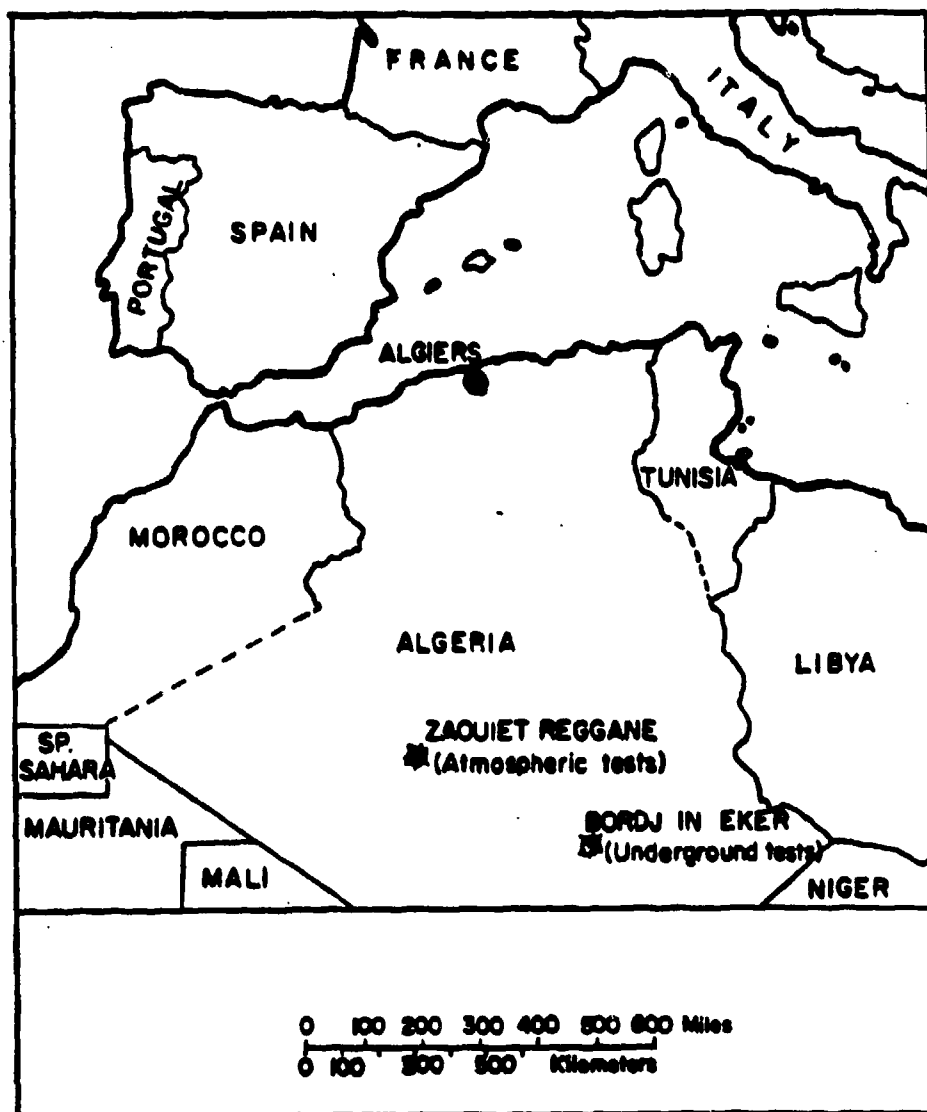


Figure 31. Location map of test sites for Republic of France

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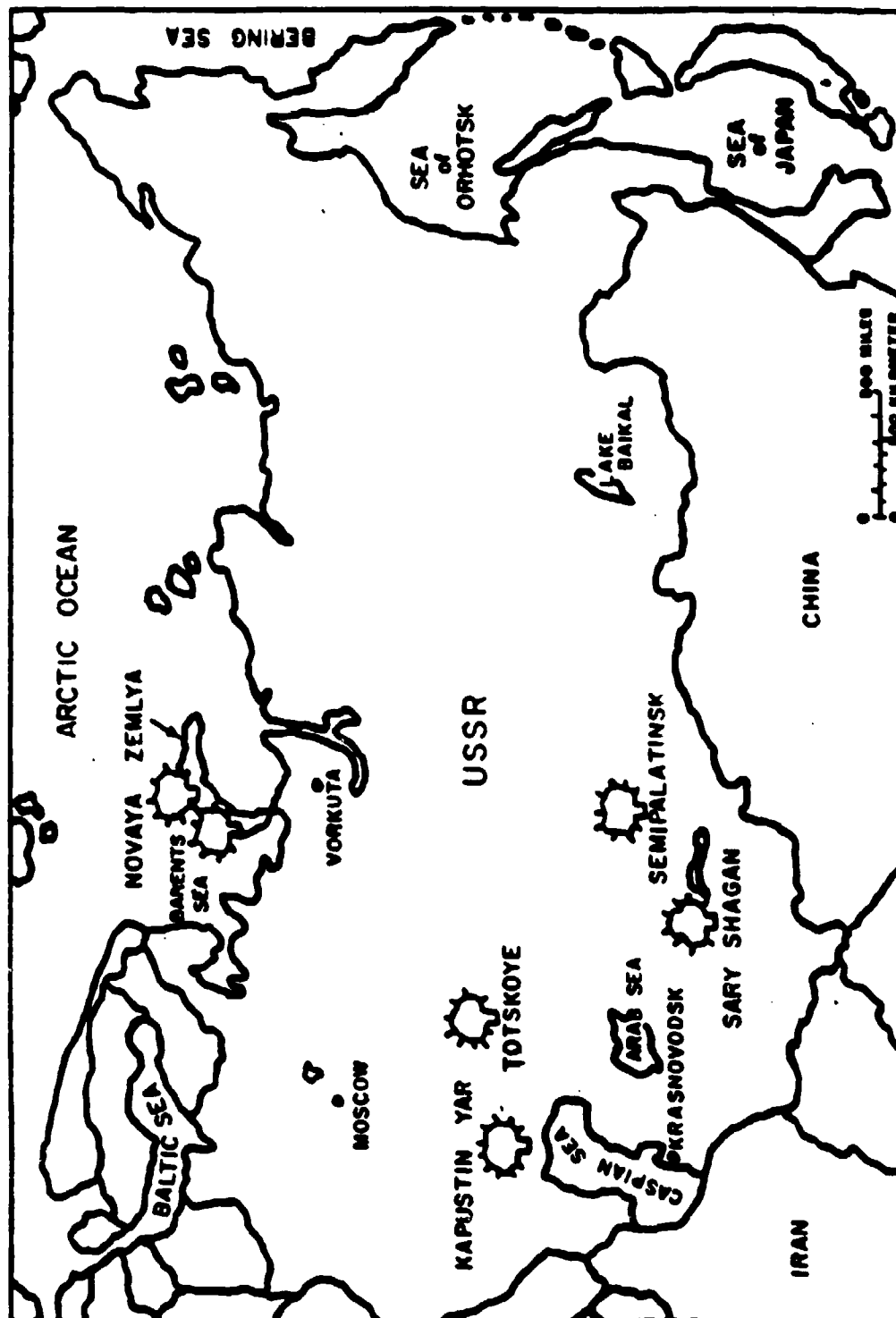


Figure 32. Location Map of Union of Soviet Socialist Republics Test Sites.

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REFERENCES

- A. Reference Numbers for Specific Types of Data.

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1. UNITED KINGDOM DETONATIONS

Operation	Round No.	Date	Time	Yield	Site and Place-ment	Height of Burst	Fall-out Data	Wind Data	Cloud Data
Hurricane	1	4	4		4,1	4,1	1	1	1,-
Totem	1	4	4		4,2	4,2	2	2	2,-
	2	4	4		4,2	4,2	2	2	2,-
Mosaic	1	4	4		4	4	-	-	-
	2	4	4		4	4	-	-	-
Buffalo	1	4	4		4,3	4	3	3	3,-
	2	4	4		4,3	4	3	3	3,-
	3	4	4		4,3	4	3	-	3,-
	4	4	4		4,3	4	3	3	3,-
1957									
Grapple-1	1	4	4		4	4	-	-	-
	2	4	4		4	4	-	-	-
	3	4	4		4	4	-	-	-
	4	4	4		4	4	-	-	-
Antier	1	4	4		4	4	4	4	4
	2	4	4		4	4	4	4	-
	3	4	4		4	4	4	4	4
1958									
Grapple-II	1	4	4		4	4	-	-	-
	2	4	4		4	4	-	-	-
	3	4	4		4	4	-	-	-
	4	4	4		4	4	-	-	-
	5	4	4		4	4	-	-	-

2. REPUBLIC OF FRANCE DETONATIONS

Operation	Shot No.	Date	Yield	Site	Placement	Fallout Data
Gertoise	1	10		10	.10,9	5
	2	10		10	10,9	6
	3	10		10	9	7
	4	10		10	10	6

3. UNION OF SOVIET SOCIALIST REPUBLICS DETONATIONS

All data except site location from Reference Number 13. All site location data from Reference Number 12.

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3. List of References.

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REFERENCES

1. Soole, B. W. (Department of Physical Research, Admiralty, Great Britain), "Surface Phenomenon at Operation Hurricane, Proceedings of Tripartite Symposium on Technical Status of Radiological Defense in the Fleets," May 16-20; Vol III. U.S. Naval Radiological Defense Laboratory, San Francisco, California. A SECRET Report.
2. [REDACTED]
3. [REDACTED]
4. [REDACTED]
5. [REDACTED]
6. [REDACTED]
7. [REDACTED]
8. [REDACTED]
9. Gerboise Rouge, La Troisieme Bombe Nucleaire Francaise, Protection Civile, No. 88, February 1961. An UNCLASSIFIED Journal.
10. Stebbins, Albert K., III, "Special Report on High Altitude Sampling Program (HASP)," DASA 539 B, Hqs, Defense Atomic Support Agency, Washington, D. C., 1 August 1961, An UNCLASSIFIED Report.

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11. ~~REDACTED~~ A SECRET - FORMERLY RESTRICTED DATA Report.

12. Scientific and Technical Abstracts and Reports, ONI-ST-2-60, Office of Naval Intelligence, Washington 25, D. C., 21 April 1960, A SECRET RESTRICTED DATA Report.

13. Scientific and Technical Abstracts and Reports, ONI-ST--63, Office of Naval Intelligence, Washington 25, D. C., 15 July 1963. A SECRET Report.

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